PASMINCO EXPLORATION

EL 2/90 BOCO
EL 8/90 NORTH PINNACLES
EXPLORATION REPORT

FOR THE PERIOD
29 FEBRUARY 1992 - 6 MAY 1993

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SUBMITTED BY: R Poltock

ACCEPTED BY: [signature]

Burnie
May 1993

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SUMMARY

Exploration undertaken by Pasminco Exploration on ELs 2/90 and 8/90 since Feb 1992 has concentrated on the underexplored NW section of the tenements, which comprise the Boco Joint Venture Agreement with Billiton. Work has included gridding, geological mapping, pole – dipole IP, soil / rock geochemistry and a gravimetric survey. This work has been of a regional nature and has highlighted areas for more detailed exploration, including drilling in 1993/94.

Geological mapping, supported by petrology and in conjunction with gravity and magnetic data, has refined the geological interpretation of the area and highlighted specific areas warranting further work. Three major stratigraphic subdivisions have been recognised which in part overlap previous divisions in the Central Volcanic Complex (CVC) and Dundas Group. These subdivisions are:

i feldspar quartz phyric felsic volcanics and overlying White Spur Formation (upper part of Lorrigan's Transition Sequence), marked by a distinctive lack of magnetic character, pervasively sericite altered, hosts mineral occurrences at Burns Peak–North Pinnacles–Silver Falls, and is regionally correlated with the Rosebery–Hercules host and hanging wall sequences.

ii feldspar phyric felsic volcanics, associated with "spiky"magnetic character, pervasively albite chlorite altered, hosts the Boco Siding pyritic alteration and is correlated with the Mt Black Volcanics.

iii mafic to felsic volcanic and Precambrian derived sediments with minor primary volcanics associated with strong magnetic character, preserved in the core of the Silver Falls Syncline and correlated with the late Cambrian Tyndall Group / Southwell Subgroup.

Other features stemming from the gravity and magnetic data include:

i definition of a major gravity axis coincident with the western flank of the Pinnacles Ridge which has been interpreted by Leaman(1993, Appendix III) as a basement rift.

ii the contact between the two felsic volcanic sequences strikes NE and is coincident with the Burns Peak Shear Zone, which extends from Mt Kershaw to the Charter Fault.

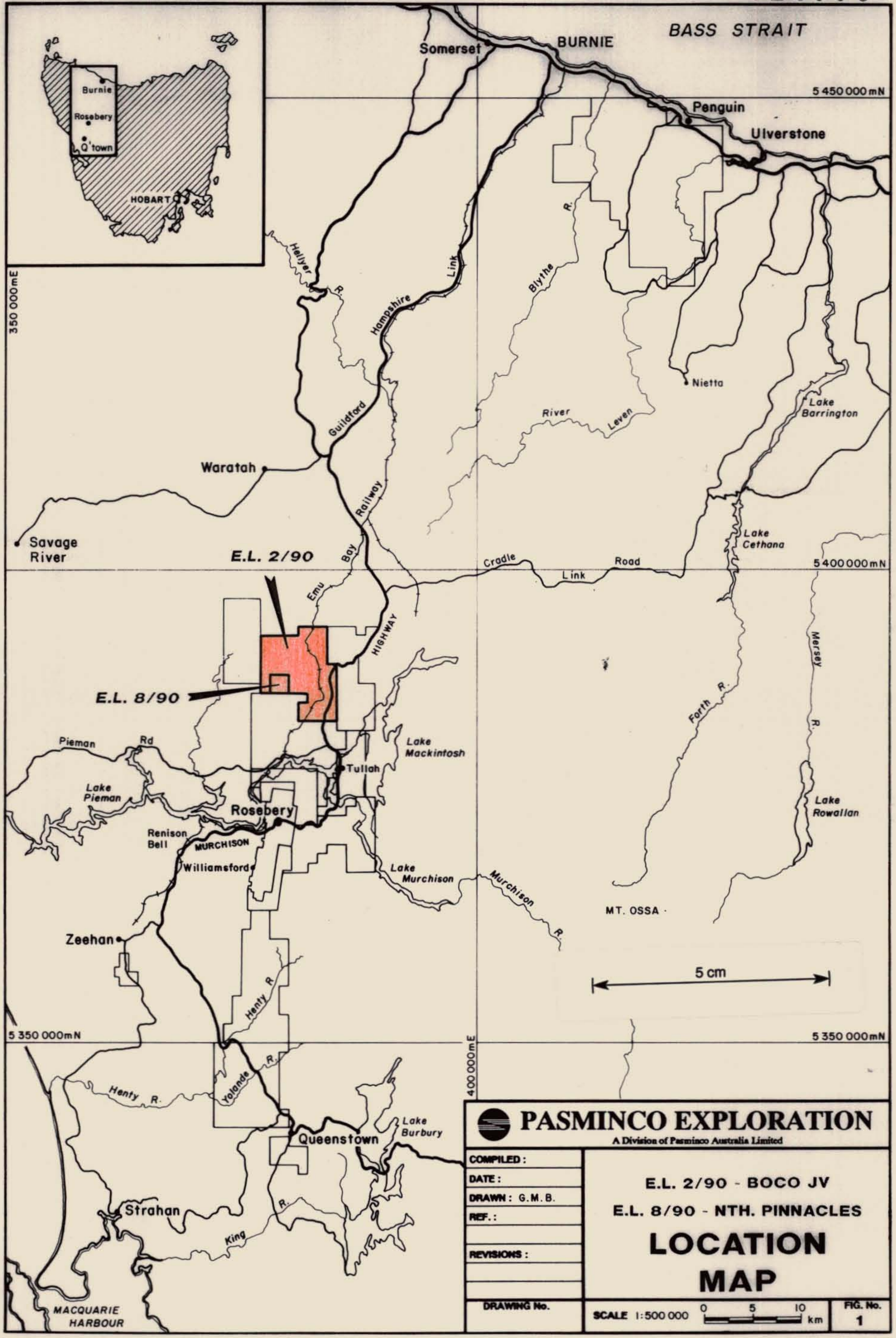
The pole-dipole IP survey has failed to detect any strong chargeability or resistivity anomalies. The prospective horizon, the contact between the felsic volcanics and overlying White Spur Formation is not associated with anomalous responses. The moderate to weak anomalies defined are interpreted to be associated with structures, the Southwell Subgroup felsic volcanics and the magnetite bearing and slightly pyritic Tyndall Group. The anomalies will be further evaluated with soil geochemistry.

A DHEM survey by Crone Geophysics has been completed in hole AK1, which was drilled at the northern end of the Boco alteration zone in 1992. No significant responses were defined.

A soil geochemical survey has been completed over the strike extensions of the Silver Falls mineralisation. The data was not available at the time of compiling this report.

This work has lead to a better understanding of the geology of the entire Boco JV area and has placed it in regional perspective. It is now possible to focus on areas of greatest exploration potential in the Silver Falls -Pinnacles area. It is recommended that a detailed program of geological mapping, in-fill gridding, soil geochemistry, lithogeochemistry, possible in-fill IP surveying and diamond drilling be undertaken during 1993/94.

012006


BASS STRAIT
BURNIE
Somerset
Penguin
Ulverstone
5 450 000 mN
5 400 000 mN
5 350 000 mN
350 000 mE
400 000 mE
Burnie
Rosebery
Q'town
HOBART
Hellyer R.
Hampshire
Link
Blythe R.
Guildford
Railway
Nietta
River Leven
Lake Barrington
Waratah
Savage River
E.L. 2/90
Emu Bay
Cradle Link Road
Lake Cethana
HIGHWAY
Mersey R.
Forth R.
E.L. 8/90
Pieman Rd
Lake Pieman
Lake Mackintosh
Tullah
Rosebery
Renison Bell
MURCHISON
Williamsford
Lake Murchison
Murchison R.
MT. OSSA
Lake Rowallan
Zeehan
5 cm
Henty R.
Yolande R.
Lake Burbury
Queenstown
Strahan
King R.
MACQUARIE HARBOUR
PASMINCO EXPLORATION
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COMPILED :
DATE :
DRAWN : G.M.B.
REF. :
REVISIONS :
DRAWING No.
E.L. 2/90 - BOCO JV
E.L. 8/90 - NTH. PINNACLES
LOCATION MAP
SCALE 1:500 000
0 5 10 km
FIG. No. 1

2 INTRODUCTION

This report documents work undertaken on Exploration Licences 2/90 Boco and 8/90 North Pinnacles in Western Tasmania, covering the period 29 February 1992 to 8 May 1993.

The two licences reported here are held under the same terms and conditions and are subject to the one joint venture agreement (The Boco JV), between licensee, the Shell Company of Australia Limited, and manager/operator, Pasminco Exploration, a division of Pasminco Australia Limited. The licences form one geographically and geologically coherent block, thus an amalgamated report is clearly the most effective method of data presentation and technical discussion. The licence renewal dates have been synchronised (8 June 1993), however budgets and expenditure on the licences remains separate, in accord with an agreement approved by the Mines Department on 11 May 1992.

EL 2/90 (55km^2) and EL 8/90 (4km^2) jointly cover 59km^2 of the Cambrian Mt Read Volcanics and are centred 17km NNE of Rosebery and 16km SW of the Hellyer Mine on Tasmania's West Coast (figure 1). The principal targets of exploration on the licences are volcanic hosted auriferous base metal massive sulphide bodies similar to those at Rosebery and Hercules.

The ELs include old workings at Boco Creek (Samuel Smith's Lode), with the Silver Falls lead workings occurring immediately outside the licences' western boundary. Advanced exploration throughout the past 20 years, principally over the North Pinnacles, Silver Falls and Boco Siding prospects, (figure 4) has left a legacy of good access tracks and grid lines on the southern half of the licences, with access in the east and northeast along the Murchison Highway and Emu Bay Railway. The northwest corner of EL 2/90 can be accessed by APPM's Huskisson Drive and Olympic Road forestry roads.

During the period covered by this report, exploration has been concentrated in the NW sector of the licence, and included geological mapping, gridding, IP, gravimetric survey and soil/rock geochemistry. This work has brought the level of geological understanding of this previously underexplored area on a par with the SE sector.

3 TENURE

Exploration Licences 2/90 (Boco) and 8/90 (North Pinnacles) of 55km^2 and 4km^2 respectively were granted to the Shell Company of Australia Limited on 20 April 1990 and 8 June 1990 respectively, each for a period of 10 years, renewable every 12 months. This followed Shell's successful tenders through the Tasmanian Department of Mines tender system.

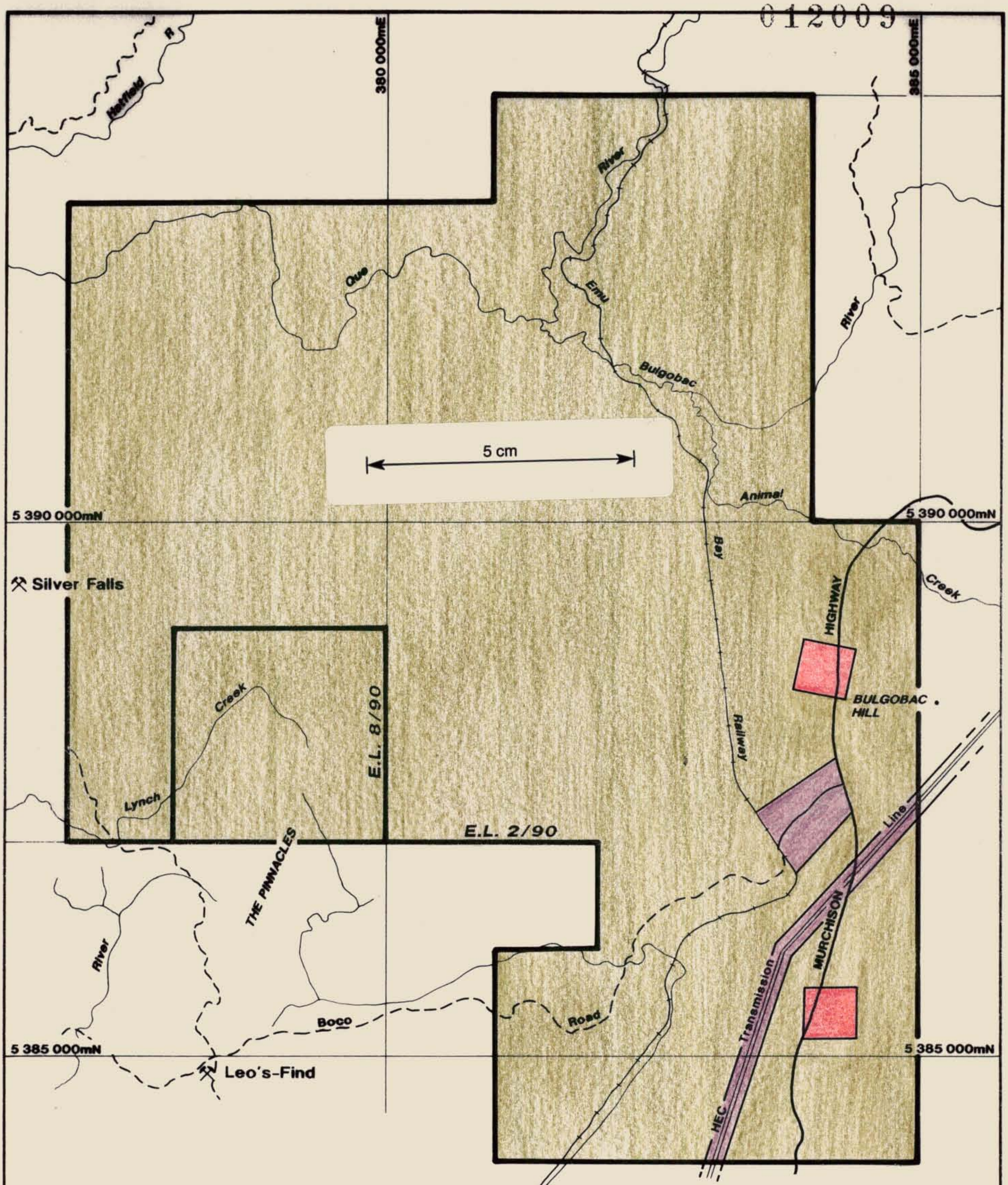
Billiton Australia, the metals division of the Shell Company of Australia, were sole managers and operators of both EL 2/90 and EL 8/90 from their dates of inception until 12 October 1990 when a heads of agreement to form a joint venture between the Shell Company of Australia Limited and Pasminco Australia Limited was signed. This Joint Venture agreement allows Pasminco to earn a 60% interest in the two licences by spending a combined total of $500 000 over 4 years from the date of inception of the Joint Venture. Pasminco Exploration manage and operate all exploration on EL 2/90 and EL 8/90 on behalf of the Joint Venture.

Both EL 2/90 and EL 8/90 were renewed in 1992 and a further one year renewal of each licence is being sought.

This report covers exploration activities on the two licences ("the Boco Joint Venture") from 29 February 1992 until 8 May 1993.

EL 2/90 excludes lands vested in the HEC, and 0.5km^2 of Mine Leases. The remainder of EL 2/90 and all of EL 8/90 are Unallocated Crown Land designed as Multiple Use Forest Land (figure 2).

012009



NOTE - The Land Tenure is only shown within E.L. 2/90 and E.L. 8/90

LEGEND

- HEC Vested Land included in E.L.
- Mining Lease
- Multiple Use Forest
- Uncommitted Crown Land

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COMPILED : G.M.B.	E.L. 2/90 - BOCO JV
DATE : May. 1993	E.L. 8/90 - NTH. PINNACLES JV
DRAWN :	
REF. :	**LAND TENURE**
REVISIONS :	
DRAWING No.	SCALE 1: 50 000 500 0 500 m
FIG. No.	2

4 REGIONAL GEOLOGY

ELs 2/90 and 8/90 are located in the Dundas Trough of western Tasmania. The prospective sequence forming part of the mid to late Cambrian Mt Read Volcanics.

Basement in western Tasmania is the Precambrian comprising dominantly green schist facies meta-sediments with minor basalts and dolerites. Higher grade amphibolite and eclogite facies also occur within the Precambrian (Turner, 1989). Basement is exposed west of the licences in the Huskisson River valley (Fig 3).

Cambrian volcanism and sedimentation developed on this continental crust, and can be subdivided into the eo–Cambrian tholeiitic Crimson Creek Formation (CCF) and the mid to late Cambrian Dundas Group and predominantly calc–alkaline Mt Read Volcanics.

The CCF was deposited in shallow but rapidly subsiding basins(Brown, 1986 and Haines, 1991). The formation includes basaltic lavas and volcaniclastics, haematite facies turbidites, carbonates, chert and minor evaporites. The formation is exposed west of the licences.

Ultramafic cumulates and volcanic equivalents were thrust onto the CCF in the mid Cambrian (Crawford and Berry 1991). These rocks are associated with strong magnetic anomalies and out crop to the west of the licences in the Huskisson Syncline (Fig 3).The ultramafics are interpreted at depth beneath EL 2/90 by Leaman (Appendix III) as the source of the large magnetic anomaly (Fig 6) between North Pinnacles and Silver Falls.

A package of sediments which post dates the ultramafics and possibly predates the MRV occurs in the NW sector of the licence. These carbonate rich siltstones, wackes and polymict conglomerates are correlated with the Westcott Argillite /Salisbury Conglomerate in the Rosebery area and are considered to form the basal units of the Dundas Group. Gradationally overlying this sequence are quartz muscovite sandstones and conglomerates largely derived from Precambrian metasediments, but with some material from felsic volcanics and ultramafics. The sequence is correlated with the Stitt Quartzite at Rosebery.

The MRV form a 200km long by 20km wide north-south trending belt along the eastern side of the Dundas Trough, adjacent to and in some areas on lapping and intruding the Precambrian basement. The volcanics include intermediate to felsic lavas, subvolcanic porphyries and granites, volcaniclastics and basement-derived sedimentary rocks. The MRV host five economically significant volcanic hosted massive sulfide deposits.

At Boco the MRV can be subdivided into three sequences on the basis of lithotypes and magnetic character. The two NW sequences (Burns Peak/Pinnacles and Tyndall/Southwell) are conformable, the SE (CVC) sequence is probably fault juxtaposed. Boundaries of these three units in part overlap the CVC and Dundas Group contacts on MRV Project Map 2 (Corbett and McNeill, 1986).

Regional structures associated with the MRV are the Rosebery Fault, splays of which probably extend into the Silver Falls area, and the Henty Fault which is located 2km east of the licences. Within the Boco JV gravity defines a prominent feature which is coincident with the western flank of the Pinnacles ridge. Leaman (Appendix III) interprets this feature as a basement rift which may be manifest at the surface as the Burns Peak Shear Zone and Pinnacles Shear Zone.

Cambrian volcanism and sedimentation was followed by predominantly basement derived late Cambrian to Devonian age sedimentation, which includes siliciclastic conglomerate, sandstone and limestone. None of these lithologies occur within the licences.

At least two phases of regional compression were associated with the mid Devonian Tabberabberan Orogeny (Keele, 1991). The development of folding, cleavage and regional thrusts in Lower Palaeozoic rocks were associated with this event. Fold trends in the Boco JV are NNE to NE.

Deformation was followed by the extensive intrusion of Devonian to Carboniferous granitoids. The Meredith Granite, located 5km west of the licences and Granite Tor, 10km to SE (see Fig 3), are associated with the main regional gravity feature in the area. Leaman models these on section, Figure 16 (see Appendix III).

These granites are associated with carbonate replacement tin mineralisation at Renison Bell and Mount Bischoff, and the Pb Zn Ag vein deposits of Zeehan and possibly Tullah Fields.

After substantial erosion of this terrane extensive Tertiary flood basalts and subvolcanic sediments were deposited. Remnants of the Tertiary gravels are preserved immediately north of the Que River on line 13980N.

Pleistocene fluvioglacial clays and gravels derived primarily from Ordovician siliciclastic conglomerates blanket the MRV to a maximum depth of 100m at Boco Siding and occur as remnant patches at Sawmill Creek.

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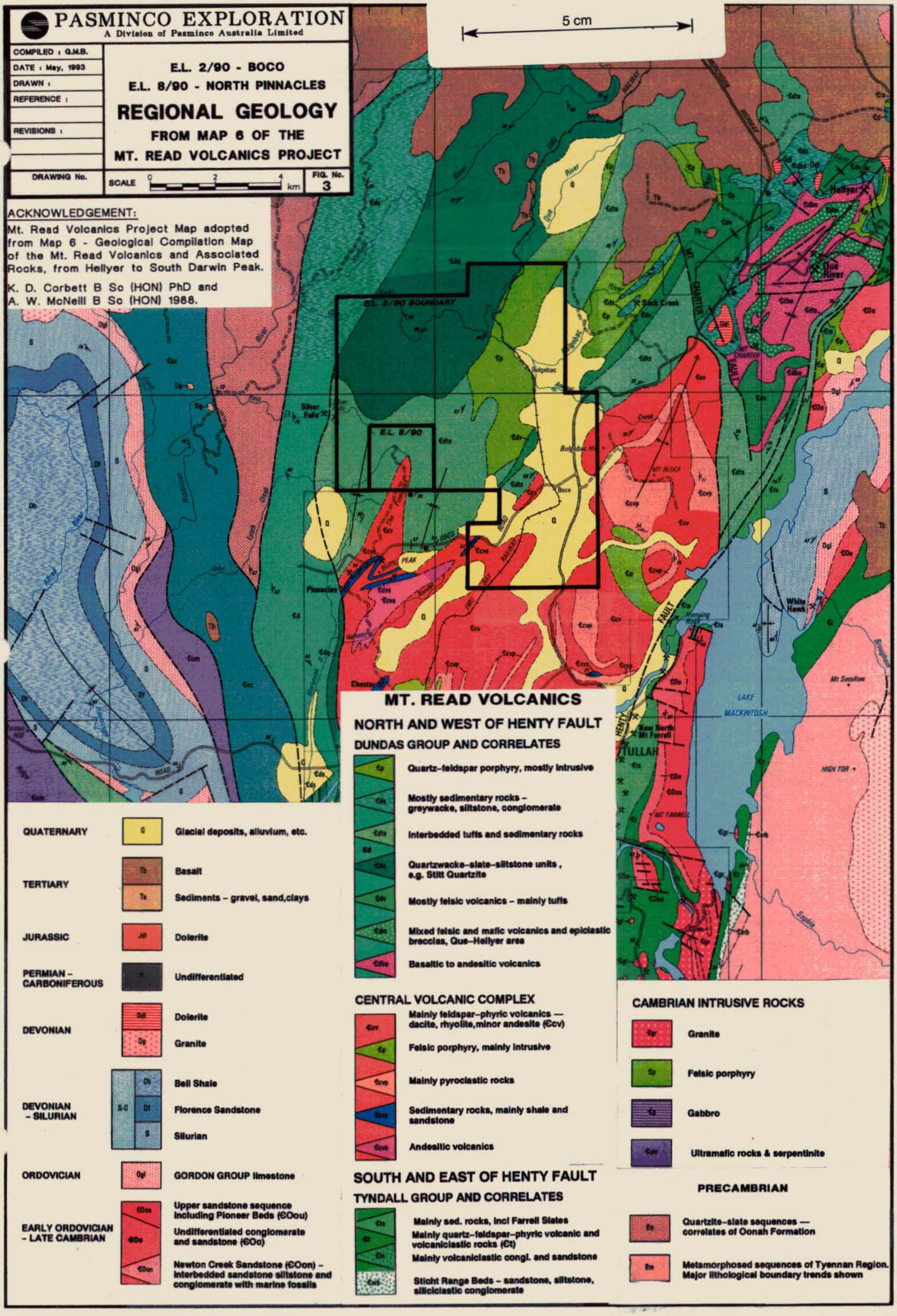
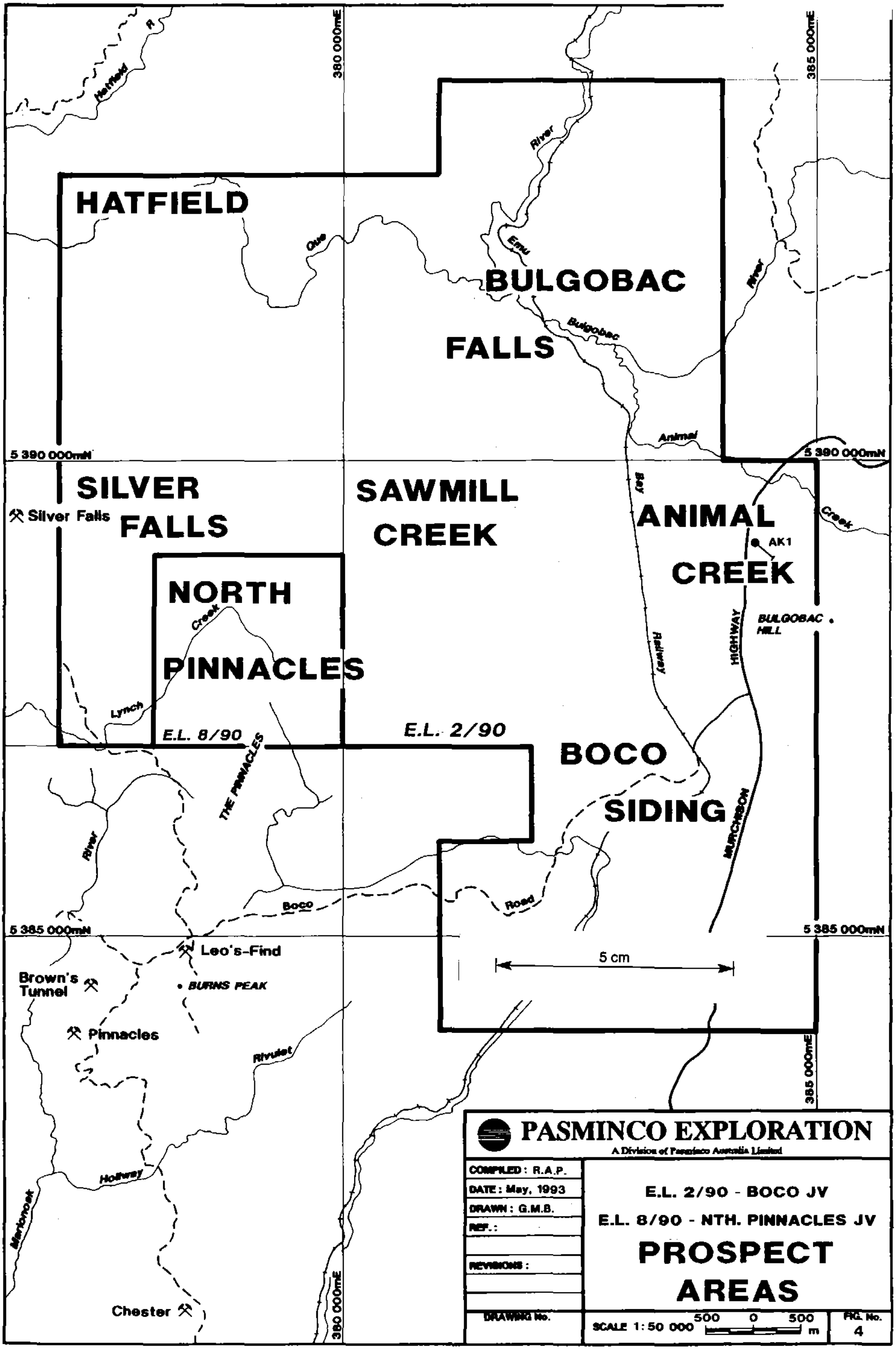

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited
COMPILED : G.M.B.
DATE : May, 1993
DRAWN :
REFERENCE :
REVISIONS :
DRAWING No.
E.L. 2/90 - BOCO
E.L. 8/90 - NORTH PINNACLES
REGIONAL GEOLOGY
FROM MAP 6 OF THE
MT. READ VOLCANICS PROJECT
SCALE 0 2 4 km
FIG. No. 3
5 cm
ACKNOWLEDGEMENT:
Mt. Read Volcanics Project Map adopted from Map 6 - Geological Compilation Map of the Mt. Read Volcanics and Associated Rocks, from Hellyer to South Darwin Peak.
K. D. Corbett B Sc (HON) PhD and A. W. McNeill B Sc (HON) 1988.
E.L. 2/90 BOUNDARY
E.L. 8/90
Hellyer
Que River
Sock Creek
Bulgobac
Silver Falls
Boco
Pinnacles
Chester
MT BLOCK
MT CHARTER
CHARTER FAULT
HENTY FAULT
TULLAH
New North
Mt Farrell
MT FARRELL
White Hawk
Hanging Rock
LAKE MACKINTOSH
Mt Swallow
HIGH TOR
QUATERNARY — Q — Glacial deposits, alluvium, etc.
TERTIARY — Tb — Basalt
Ts — Sediments - gravel, sand, clays
JURASSIC — Jdl — Dolerite
PERMIAN - CARBONIFEROUS — Undifferentiated
DEVONIAN — Ddl — Dolerite
Dg — Granite
DEVONIAN - SILURIAN — S-D — Db — Bell Shale
Df — Florence Sandstone
S — Silurian
ORDOVICIAN — Ogl — GORDON GROUP limestone
EARLY ORDOVICIAN - LATE CAMBRIAN — €Oou — Upper sandstone sequence including Pioneer Beds (€Oou)
€Oc — Undifferentiated conglomerate and sandstone (€Oc)
€Oon — Newton Creek Sandstone (€Oon) - interbedded sandstone siltstone and conglomerate with marine fossils
MT. READ VOLCANICS
NORTH AND WEST OF HENTY FAULT
DUNDAS GROUP AND CORRELATES
€p — Quartz-feldspar porphyry, mostly intrusive
€ds — Mostly sedimentary rocks - greywacke, siltstone, conglomerate
€dts — Interbedded tuffs and sedimentary rocks
€d
€dq — Quartzwacke-slate-siltstone units, e.g. Stitt Quartzite
€dv — Mostly felsic volcanics - mainly tuffs
€dm — Mixed felsic and mafic volcanics and epiclastic breccias, Que-Hellyer area
€dba — Basaltic to andesitic volcanics
CENTRAL VOLCANIC COMPLEX
€cv — Mainly feldspar-phyric volcanics — dacite, rhyolite, minor andesite (€cv)
€p — Felsic porphyry, mainly intrusive
€cvp — Mainly pyroclastic rocks
€cvs — Sedimentary rocks, mainly shale and sandstone
€cva — Andesitic volcanics
SOUTH AND EAST OF HENTY FAULT
TYNDALL GROUP AND CORRELATES
€ts — Mainly sed. rocks, incl Farrell Slates
€t — Mainly quartz-feldspar-phyric volcanic and volcaniclastic rocks (€t)
€tc — Mainly volcaniclastic congl. and sandstone
€srb — Sticht Range Beds - sandstone, siltstone, siliciclastic conglomerate
CAMBRIAN INTRUSIVE ROCKS
€gr — Granite
€p — Felsic porphyry
€g — Gabbro
€um — Ultramafic rocks & serpentinite
PRECAMBRIAN
Po — Quartzite-slate sequences — correlates of Oonah Formation
Pm — Metamorphosed sequences of Tyennan Region. Major lithological boundary trends shown


HATFIELD
BULGOBAC
FALLS
SILVER
FALLS
SAWMILL
CREEK
ANIMAL
CREEK
NORTH
PINNACLES
BOCO
SIDING
E.L. 8/90
E.L. 2/90
380 000mE
385 000mE
5 390 000mN
5 385 000mN
Hatfield
R
River
Que
Emu
Bulgobac
Animal
Creek
Bay
Railway
HIGHWAY
MURCHISON
AK1
BULGOBAC HILL
Silver Falls
Creek
Lynch
THE PINNACLES
River
Boco
Road
5 cm
Leo's-Find
BURNS PEAK
Brown's Tunnel
Pinnacles
Rivulet
Hollway
Marionoak
Chester
PASMINCO EXPLORATION
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COMPILED : R.A.P.
DATE : May, 1993
DRAWN : G.M.B.
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REVISIONS :
DRAWING No.
E.L. 2/90 - BOCO JV
E.L. 8/90 - NTH. PINNACLES JV
PROSPECT
AREAS
SCALE 1: 50 000
500 0 500
m
FIG. No.
4

012014

5 PREVIOUS EXPLORATION

Previous exploration completed on what is now the Boco JV has been summarised in Kirsner (1992).

Exploration carried out by Pasminco in the first 14 months of management from Oct 1990 – Feb 1992 is reported in Kirsner(1992) and included;

i photogrammetry and generation by the HEC of base sheets at 1:10 000, 1:5 000 and 1:2 500 scales.
ii computerisation of all drill collars and downhole surveys.
iii an aeromagnetic and radiometric survey over the entire JV.
iv gravimetric survey at Animal Creek/ Boco and North Pinnacles/Silver Falls.
v acquisition reports and preliminary interpretations were completed on the aeromagnetic and gravity data sets.
vi regional geological mapping traverses throughout the JV. This work followed on from the western Tasmanian base metal study of Wright, Lees and Lorrigan (1991).
vii mapping and relogging drill core in the Boco Siding alteration zone.
viii drilling AK1 to 553.7m at the northern end of the Boco Siding zone. This hole was targeted on magnetic/gravity features and the contact between the CVC and Dundas Group.

6 WORK UNDERTAKEN FEBRUARY 1992 - APRIL 1993

6.1 Gridding

The NW sector of the licence has been gridded at a reconnaissance scale with a line spacing of 400m. For grid location see Figure 5 and for line details see Figures 7 – 10.

The grid was planned to cover the northern strike extension of the Silver Falls mineralisation and associated soil geochemical anomalies previously defined by Aberfoyle (Taylor, 1979) and EZ (Mollison, 1980).

Work completed on the lines includes geological mapping, IP, soil geochemistry and gravimetric surveying.

Lines were cut at 135° true north bearing (perpendicular to the regional strike) and the baseline at 045°. A total of 40km of grid and access lines have been cut. The work was completed in two phases, the main section of grid was cut by Greg Mallinson in December – January and extensions were cut by Alliston Exploration in April.

All lines were slope corrected and pegged at 20m intervals.

A survey pick up of points on line 12400N (9350E) by Gary Watts has confirmed the grid location.

6.2 Geology

6.2.1 ROCK SAMPLING

A total of 74 rock samples were collected in the course of mapping, locations are plotted on Figures 7 - 10. Of these samples;

- 53 were for a reference collection, numbers 34901 – 34953.
- 5 were analysed for ore and pathfinder suite elements (see Appendices I and II).

- 21 were analysed for whole rock elements, numbers 32949 -32969 (see Appendices I and II).

6.2.2 PETROLOGY

Nine thin sections were described by Tony Crawford (see Appendix VI). These rocks comprised predominantly coarse grained sediments from throughout the stratigraphy. The aim of this work was to define the provenance and possible stratigraphic position within the MRV. Discussion is incorporated in the stratigraphic section.

6.2.3 STRATIGRAPHY

Stratigraphic relationships and unit thickness are presented in schematic stratigraphic columns (see Figs 11 and 12).

Westcott Argillite/ Salisbury conglomerate
(Cwa Fig 5. Thin sections 34922 34948)

Interpreted as the stratigraphic base in the Boco JV area, they are only exposed in the W – NW sector of the licence on Huskisson Drive, Olympic Road and the lower reaches of the Que River.

The unit comprises mauve dolomitic siltstone -greywacke-polymict conglomerate, with a total thickness in excess of 500m(see Fig 11). The sediments are thickly bedded, frequently graded and occasionally have well developed ripple marks.

Contacts with the underlying Precambrian? quartzite and slates exposed on Huskisson Drive are faulted. Contacts with the overlying quartz sandstone to the east are gradational and locally faulted (D.Selley, Tas Uni, pers comm 1993).

Lithic constituents of coarser grained lithologies are described by Crawford (Appendix VI) and in order of abundance comprise:

- sedimentary clasts including siltstone, sandstone, chert and limestone (frequently

haematitic).
- chloritized aphyric basalt – andesite of possible ophiolite affinities.
- pelitic schist and gneiss or granitoid.
- serpentinite and coarse grained anorthosite.

The sandstone and the groundmass of the conglomerates is comprised of polycrystaline quartz (vein/metamorphic), plagioclase, muscovite, biotite and K feldspar.

The inferred provenance includes haematitic sediments, limestone, metamorphics and ophiolite. Crawford (Appendix VI) sees no material that can be confidently identified as being sourced from the Mt Read Volcanics.

On the basis of provenance the unit is allocated to a stratigraphic position post dating the CCF and ophiolite emplacement but predating Mt Read volcanism; and is tentatively correlated with the Westcott Argillite at Rosebery on the basis of clast type, dolomitic component and association with the Stitt Quartzite (Green 1983). However, at Rosebery Green (1983) states that the Stitt Quartzite overlies the Westcott Argillite which is the reverse of that observed at Silver Falls.

Stitt Quartzite
(Csq Fig 5. Thin section 34944)

The quartzite is exposed only in the western limb of the Silver Falls Syncline. Extensive exposures occur in the Que River, the NE extent of the Olympic Road, Ross Creek and John Lynch Creek. Contacts with the underlying Wescott Argillite are gradational and locally faulted.

The dominant rock type is a well bedded quartzose sandstone with grey siltstone partings and occasional quartz cobble conglomerate horizons. The total thickness may be in excess of 500m (see Fig 11).

Lithic constituents in order of abundance in a coarse grained sandstone (TS 34944) are as follows:

- quartzite.
- sericitized, quartz–phyric, glassy felsic lava.
- quartz muscovite schist.
- chlorite (serpentinite or volcanic glass?).

The sand grade component includes both polycrystalline and phenocrystic quartz and muscovite. Minor chrome spinel has also been reported by Aberfoyle in thin sections at Silver Falls (Taylor, 1979).

The quartzites are correlated with the Stitt Quartzite at Rosebery on the basis of lithology and stratigraphic associations (see Fig 11).

Pinnacles Rhyolite
(CPr Fig 5)

The rhyolite is the lowest stratigraphic unit which is exposed on both limbs of the Silver Falls Syncline. The volcanics are frequently altered and host mineralisation at Silver Falls and North Pinnacles.

The volcanics are massive, sparsely feldspar > quartz phyric, with a fine grained groundmass. The western exposures are pervasively sericite carbonate +– pyrite altered and in the east they are moderately sericitized, with the greatest intensity occurring in shear zones.

Contact with underlying lithologies in the west are not exposed, but the description of abundant felsic detritus in the top of the underlying quartzite by Taylor (1979) indicates that it may be gradational. In the Pinnacles area the rhyolite forms the upper part of Lorrigan's (1992) "Transition sequence" (CII), the lower part of which includes the Browns Tunnel host rocks. This lower sequence was intercepted beneath the Pinnacles Rhyolite in hole BPD 71, 2km south of the EL 8/90 boundary.

Quartz – Feldspar phyric lavas/intrusives/clastics
(Cq Fig 5)

This distinctive quartz rich (quartz crystals to 8mm, rounded, embayed and with inclusions) but texturally extremely variable unit forms a marker horizon between the Pinnacles Rhyolite and overlying White Spur Formation. It occurs on both limbs of the Silver Falls syncline and the Pinnacles anticline (see Fig 5, 11 and 12). Thickness of the unit ranges from 1m – 100m.

Lithological variants include:

- medium grained equigranular quartz feldspar rock, which in thin section was described in an Aberfoyle report (Taylor, 1979) as a porphyritic microgranite (Silver Falls).
- equigranular quartz feldspar rock with locally abundant sericitized pumice clasts (EZ costean 5 390 270N).
- quartz crystal sandstone, exposed on the drill access road to hole NPP 214.
- quartz feldspar crystal lithic mass flow (lithics are fine grained white rhyolite) exposed in the eastern limb of the Pinnacles anticline at 5 386 000N.

The unit is interpreted as a shallow intrusive to extrusive rhyolite with quartz crystal rich clastics being shed from the lavas.

White Spur Formation
(Cws Fig 5)

Exposures occur mainly on the eastern limb of the Silver Falls syncline in the headwaters of John Lynch Creek. The sequence is interpreted to have been faulted out by a splay of the Rosebery Fault in the west.

The sequence comprises grey – black siltstone with felsic mass debris flows. The sediments overlie the Pinnacles Rhyolite /quartz–phyric unit and inturn are overlain with apparent conformity by Tyndall Group correlates. The sequence, lithologies and stratigraphic associations are similar to those at Lynchford south of Queenstown.

The felsic mass debris flows are frequently graded from a coarse crystal lithic base to a vitric siltstone top. The siltstones are considered to represent the ambient sedimentation. The maximum thickness of graded units is 50m. The interpreted basal unit on the Sawmill Creek track contains carbonate silica pyrite altered felsic clasts and ragged massive pyrite fragments. A similar lithology is reported by Poltock (in Sheppard, 1987) in the Bulgobac River at 381 700E.

Felsic porphyry sills and lavas associated with these siltstones are restricted to the area east of 381 000E (see MRV Map 2, Corbett and McNeill, 1986) indicating that there may be a major structure at this easting. Some of these porphyries are the source of the near surface component of a magnetic anomaly centred at 383 000E 5 392 000N.

The siltstone and mass debris flows are correlated with the White Spur Formation on the basis of:

- grey siltstone and felsic mass flow sequence overlies a prominent quartz crystal sandstone which in turn overly predominantly feldspar-phyric rhyolites. This is a similar association to that at White Spur 10km south of Rosebery.

- the overlying mafic to felsic-derived magnetite bearing volcaniclastics are lithologically very similar to those at Lynchford (5km south of Queenstown), where they also overlie siltstone and felsic mass debris flows.

Tyndall Group - Lynchford Tuff

(Ct Fig 5. Thin section 34915)
Clt

These mafic to felsic derived sandstones are exposed on the Silver Falls track at 378 600E 5 388 440N and 377 380E 5 388 760N and in the Que River at 381 300E 5391 900N (Poltock in Sheppard, 1987).

The horizon which is <50m thick represents the first appearance of mafic volcanic detritus and magnetite in the sequence and is a distinctive marker horizon both in lithotype and magnetic character (see Fig 6).

Contacts with the units above and below have not been observed but the bedding attitude is similar. Magnetic trends associated with the unit conform with fold trends in the enclosing sediments.

The sandstones are coarse grained, composed of both a lithic and crystal component. In order of abundance lithics are:

- plagioclase and quartz phyric dacite – rhyolite lavas.
- volcaniclastic sandstone.
- chloritic fragments (glass or serpentinite).
- quartz mica schist.

The detrital component includes phenocrystic plagioclase, augite, hornblende, quartz and Fe Ti oxides. Crawford (Appendix VI) interprets the provenance as being Que/Hellyer Footwall type andesites, however the abundance of magnetite is atypical.

The sandstones are correlated with the Tyndall Group/Lynchford Tuff on the basis of;

- lithological similarity, compare petrological description 34915 (Boco JV) and 31624 (EL 11/85) see Appendix VI.
- similar association with the underlying siltstone and quartz feldspar crystal felsic mass debris flows at Lynchford and Silver Falls.
- being overlain by sediments and volcanics. Crawford (Appendix VI No 34932) sees similarities of the latter to the late Cambrian Southwell Subgroup.
- + McKibben morphology of cpx

Southwell Subgroup

(Css Fig 5. Thin sections 34902 34933 34932)

A thick sedimentary sequence, probably in excess of 750m, occupies the core of the Silver Falls Syncline.

The sequence comprises predominantly grey – khaki siltstone with subordinate micaceous lithic sandstone, polymict conglomerate, felsic mass debris flows and primary felsic volcanics. The internal stratigraphy and structure are not well understood due to poor exposure through most of the area.

The sequence is correlated with the Southwell Subgroup on the basis of petrology and association with Tyndall Group-like volcaniclastics.

A brief description of the main lithotypes in order of abundance is:

- grey to khaki siltstones.
- micaceous, feldspathic, lithic sandstone/grit with minor detrital magnetite. Best exposures are along the Silver Falls track.
- polymict volcaniclastic conglomerate (thin sections 34902 34933). Lithics include aphyric to slightly plagioclase–quartz phyric lavas, which have undergone intense chlorite haematite alteration, and pelitic schist. The detrital components in order of abundance are plagioclase and quartz phenocrysts, muscovite, Fe Ti oxides, chromite and tourmaline.
- felsic mass debris flows (thin section 34932), occur in the northern part of the syncline core towards the top of the exposed sequence. The mass flows occur within siltstones as graded units up to 75m thick. They are composed of plagioclase >quartz crystals, Fe Ti oxides and clasts of glassy lava and tuffaceous siltstone. The presence of Fe Ti oxides differentiate these felsic mass debris flows from those in the White Spur Formation.

Discussion and stratigraphic implications

1. The basal sequences in the NW sector of the Boco JV area are interpreted as correlates of the Wescott Argillite and Stitt Quartzite. The two units dip and young east (similar attitude to the Rosebery Fault) and form a continuous sequence immediately west of the Rosebery Fault from the Que River to Rosebery, 18km to the south.

The presence of ophiolite detritus and the lack of felsic volcanic detritus in the Westcott Argillite suggests that it's deposition predates Mt Read Volcanism but post dates ophiolite emplacement.

The upper part of the Stitt Quartzite was deposited at the same time as felsic (presumably Mt Read) volcanics. Sericitized felsic detritus is reported in petrology by Taylor (1979). The presence of minor amounts of galena and sphalerite in the quartzite may indicate that the unit acted as a footwall to the Silver Falls mineralisation.

2. The Pinnacles Rhyolite - White Spur Formation, equates with the upper part of Lorrigan's (1992) transition sequence (CII).The lower part of this sequence hosts mineralisation at Browns Tunnel and was intersected in hole BPD 71 at North Pinnacles within EL 44/88. This lower sequence does not occur on the western limb of the Silver Falls syncline; in fact neither does the interpreted base of the MRV in the area, Lorrigan's CI sequence. This suggests that either the stratigraphy has been incorrectly interpreted and/or there is rapid thinning between Pinnacles and Silver Falls. This rapid thinning is supported by the gravity data, which Leaman (Appendix III) interprets to be the effect of a rift basin between Pinnacles and the western limb of the syncline.

3. A major change in the nature of Mt Read Volcanism occurs after deposition of the White Spur Formation and is marked by the occurrence of magnetite, which in varying proportions is common to all lithologies above this stratigraphic level.

4. Mafic to felsic volcanic derived magnetite bearing volcaniclastics have been equated with the Tyndall Group, and more specifically the Lynchford Tuff on the basis of lithotypes (compare thin section description 34915 with 31624 from the Lynchford Tuff) and stratigraphic position overlying a grey siltstone/quartz feldspar crystal mass flow association.

5. The youngest Cambrian unit in the core of the Silver Falls syncline is tentatively correlated with the Southwell Subgroup on the basis of Crawford's petrological description No 34932 and the occurrences of similar lithologies to those described by Pemberton et al (1991)in the Cradle Mountain Link road area.

Stratigraphic confusion between the Tyndall Group and Southwell Subgroup has also been recognised by Pemberton op cit suggesting some overlap / equivalence.

6. Intensely chlorite and haematite altered felsic volcanic detritus in the Southwell Subgroup conglomerates is indicative of a strong hydrothermal alteration system (Crawford, Appendix VI No 34902). The source for this material and some of the magnetite may have been the rhyodacites of the Red Hills -Sedgwick - Darwin areas.

7. Sandstones/wackes of metamorphic, felsic volcanic and ophiolite derivation i.e. the Animal Creek Greywacke have been described by Crawford (Appendix VI) from several stratigraphic levels within the Boco JV. Although this is a distinctive rock type it is not unique and thus not a good marker unit.

6.2.4 MINERALISATION AND ALTERATION

All mineralisation located to date in the NW sector of the licence is associated with the upper part of the Pinnacles Rhyolite and base of the overlying White Spur Formation as exposed on the eastern and western limbs of the Silver Falls syncline. This horizon is the upper section of Lorrigan's (1992)"Transition sequence" and may be equated with the Rosebery /Hercules horizon. Minor mineralisation has also been located in the Stitt Quartzite. The occurrence of haematitic cherts in Southwell Subgroup siltstones may be indicative of mineralisation.

Mineralisation has been identified and sampled by previous workers. Five samples were analysed during the 1992/93 year for ore and pathfinder suite elements without significant results. Analytical data and sample locations are listed in Appendices I and II.

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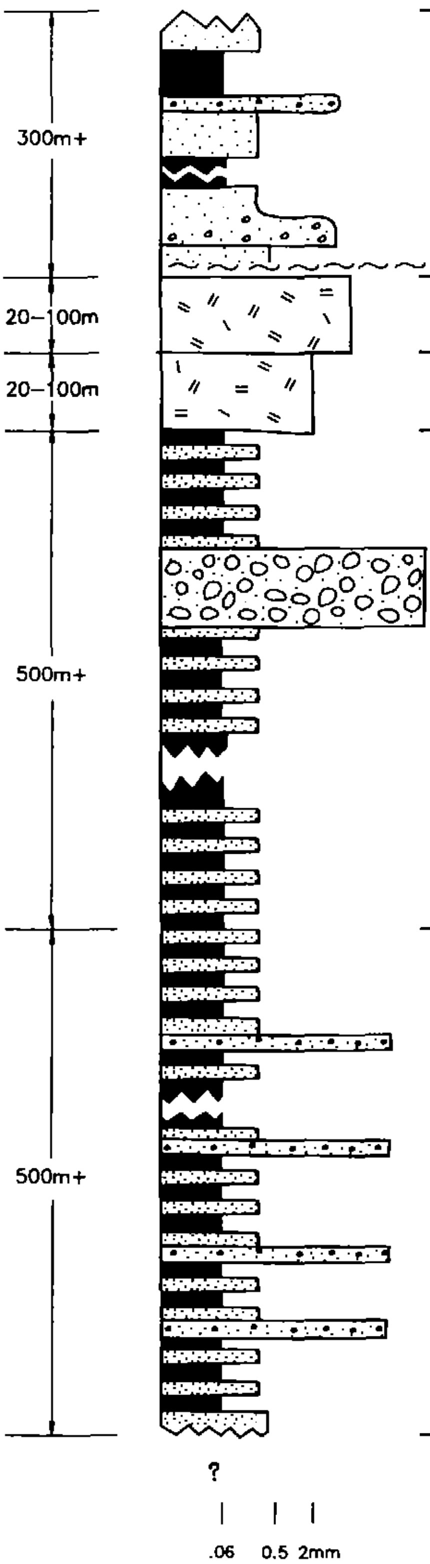

Quartz muscovite sandstone, siltstone and pebble conglomerate.
Provenance metamorphics, chlorite–hematite altered felsic volcanics and ophiolite.
Detrital minerals – tourmaline, magnetite, chromite.

ROSEBERY FAULT?

Quartz feldspar crystal sandstone – quartz feldspar phyric lava/intrusive.
Disseminated and veinlet galena.

Rhyolite lava? sparsley feldspar phyric
Silver Falls Prospect host, disseminated and veinlet galena > sphalerite

STITT QUARTZITE

Quartz muscovite sandstone, siltstone and quartzose conglomerate.
Provenance, meta sediments, felsic volcanics and ophiolite.
Detrital minerals – chromite
Mineralization localized trace of galena/sphalerite on joint faces and disseminated.

Siltstone – greywacke – conglomerate, pink–brown carbonate rich matrix.
Provenance metamorphics (schist gneiss) ophiolite and Success Creek Group hematitic siltstone.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : R.A.P.	E.L. 2/90 – BOCO JV
DATE : April, 1993	E.L. 8/90 – NORTH PINNALCES JV
DRAWN : G.M.B.	SCHEMATIC STRATIGRAPHIC COLUMN
REFERENCE :	**WESTERN LIMB OF SILVER FALLS SYNCLINE**
REVISIONS :	
DRAWING No. SC_WLSFS	SCALE 1:2000
	FIG. No. 11

Western Limb of the Silver Falls syncline: Silver Falls – John Lynch Creek

Variably sericite silica carbonate altered rhyolite and quartz feldspar crystal rocks are exposed for a 3km strike from the EZ costean at 10 400N 9 800E in the north to John Lynch Creek in the south.

The majority of this zone lies immediately west of EL 2/90 in Pasminco's EL 1/93 but the altered horizon is interpreted to dip east beneath EL 2/90.

The best exposure and mineralisation located to date is at the old Silver Falls prospect (shallow pits and gouges). Mineralisation is disseminated – veinlet style, hosted in rhyolite and quartz feldspar porphyry, with typical assays from rock chips being 65ppm Cu, 2.05% Pb, 0.09% Zn. Sainty (1984) reported values of 40ppm Cu, 3.35% Pb, 0.69% Zn from the EZ costean.

The Silver Falls mineralisation was tested by 4 small diameter (18mm) diamond drill holes ranging from 22 – 50m depth by EZ in 1949. Only a negligible amount of the core was assayed and the current state of the core renders it next to useless. Sampling to date at Silver Falls has not been representative and there is no indication of grade or metal zonation.

Alteration indices AI = (100 K_2O + MgO)/(K_2O + MgO + Na_2O + CaO) from the host volcanics are between 32 – 44, probably reflecting the silica carbonate style of alteration.

Soil geochemistry by Aberfoyle (Taylor, 1979) and EZ (Mollison,1980) defined the zone with anomalous Cu Pb Zn. The current survey by Pasminco extended and infilled this earlier work.

Eastern limb of the Silver Falls syncline

PINNACLES AREA

Three mineralised occurrences have been located in this area, occurring within the rhyolite and at the contact with the White Spur Formation. The occurrences have been summarised by Randell (1990b) and are as follows:

- Silver Falls track 378 850E 5 387 850N, limonite manganese pyrite joints/veins in a structurally complex zone on the contact between the rhyolite and White Spur Formation. Rock chips assay 0.27% Pb, 15g/t Ag and 0.1g/t Au.
- DDH NPP 214, 5m @ 0.06% Pb, 0.11% Zn in quartz carbonate veins.
- DDH NPD 004, 3m @ 1.76% Pb, 0.07% Zn in quartz carbonate veins within brecciated pyritic rhyolite. Rock chips in this area assayed up to 3.1g/t Au and 33g/t Ag.

SAWMILL CREEK TRACK 381 225E 5 389 640N

The interpreted base of the White Spur Formation, comprises a coarse felsic mass flow with clast selective to pervasive silica-carbonate alteration with stringers and "clasts" of fine grained pyrite. Selected rock chips were not anomalous in ore or path finder elements (see Appendix II, sample 34935).

The interpreted northern continuation of this horizon has been located by Poltock (in Sheppard, 1987) in the Bulgobac River at 381 750E 5 391 700N. At this location it comprises a felsic mass debris flow with fine grained slightly pyritic carbonate clasts.

Mineralisation hosted by the Stitt Quartzite and Southwell Subgroup

In addition to the felsic volcanic association, minor mineralisation and alteration is associated with the Stitt Quartzite and the Southwell Subgroup. On line 13980N, the Stitt Quartzite hosts minor galena / sphalerite on joint faces and as disseminations, the latter described in thin section No 34944 (Appendix VI). This mineralisation may be Devonian granitoid related or Cambrian in age, the quartzite possibly forming the footwall to felsic volcanic hosted mineralisation at Silver Falls.

On line 10 400N at 10750E haematitic chert occurs as angular float blocks which are considered to be close to outcrop. Thin section 34904 has been described by Crawford (Appendix VI) as *either altered serpentinite or a sinter. Neither of these interpretations fit the field evidence, the* chert being association with siltstone and micaceous sandstone and is interpreted to be a silicified fracture.

Summary of mineralisation and alteration

i Predominantly lead with subordinate zinc and occasionally gold and silver.

ii Strata bound within the Pinnacles Rhyolite or the basal section of the overlying White Spur Formation.

iii Occurs in quartz carbonate veins, breccias, stringers and occasionally disseminated.

iv Associated with silica sericite carbonate alteration with minor pyrite.

Despite mineralisation being dominantly vein style it is interpreted as having affinities with volcanic hosted massive sulfide mineralisation rather than Devonian granitoid mineralisation. This is based on the mineralisation being essentially strata bound and the host felsic volcanic horizon having similarities to the Rosebery Hercules host and hanging wall sequences.

6.3 Gravimetric Survey

A gravity survey, infilling the regional Mines Department coverage in the NW of the licence was conducted by Dr Bob Richardson from the Tasmanian Department Mines Department during February and April.

A total of 274 stations were surveyed. Survey levelling was by pressure tube, barometer and to a lesser extent GPS. Additional survey control points were established in the Huskisson Drive –Olympic Road area by Gary Watts. The Mt Ramsay trig was used for this work, which necessitated helicopter support.

The reduced survey data was presented as Bouguer anomaly and residual form. An acquisition and interpretation report in conjunction with magnetics interpretation has been completed by Leaman Geophysics (Appendix III).

6.4 Gravity and Magnetics Interpretation

6.4.1 WORK UNDERTAKEN

Leaman Geophysics was commissioned to carry out the interpretation of magnetic and gravity data and requested to address several key points that were considered by the writer to be significant in defining the exploration potential of the area. These points are as follows:

- i define structures and associated alteration intersecting the laterally extensive "blind" prospective horizon at the base of the White Spur Formation between Pinnacles and Silver Falls.
- ii define the probable source of the large magnetic anomaly centred at 383 E 5 392 000N.
- *iii establish the nature and thickness of the CVC at Boco Siding and the relationship with the* CVC at Burns Peak – North Pinnacles.

These points have been addressed along with several other salient features and placed in the regional context of the Mt Read Volcanics.

Leaman Geophysics was supplied with an updated 1:25 000 geological interpretation (Fig 5) and a set of magnetic susceptibility data for major rock types in the area (see Table 1). Aeromagnetic data is from the Pasminco survey reported in Kirsner (1992).

Interpretation and modelling by Leaman has been carried out in the regional context of the MRV in the Boco – Burns Peak – Sock Creek area. To appreciate the effects of the Devonian granites on the gravity it has been necessary to model regional profiles which included the Meredith and Granite Tor granites.

Table 1.

MAGNETIC SUSCEPTIBILITY DATA FOR MAJOR ROCK UNITS
IN THE SILVER FALLS - SAWMILL CREEK AREA.

Unit	SI x 10-3	Cgs
Southwell Subgroup		
siltstone/sandstone	0.03 - 0.19	0.0000004 - 0.000002
polymict conglomerate	0.30 - 34.00	0.0000041 - 0.000430
Tyndall Group		
volcaniclastic	14.00 - 33.00	0.00018 - 0.000414
White Spur Formation		
siltstone	0.16 - 0.38	0.000002 - 0.000004
felsic mass flows	0.05 - 0.10	0.0000006 - 0.000001
Pinnacles Rhyolite	0.07 - 0.40	0.0000009 - 0.000005
Quartz porphyry	0.10 - 0.40	0.000001 - 0.000005
" "	0.70 - 6.00	0.0000087 - 0.000075

6.4.2 DISCUSSION OF MAGNETIC AND GRAVITY FEATURES

1. Structural focus for blind targets at the base of the WSF between Pinnacles – Silver Falls – Burns Peak

A prominent, regional NNE trending gravity feature grading from less dense in the SE to greater density in the NW coincides with the western flank of the Pinnacles Ridge. Leaman (1993) interprets the feature to be associated with major changes in the nature of basement and probably defining rift fill (see Appendix III, Figs 16–18). At the surface this basement structure may be manifest as the Pinnacles Shear Zone and the Burns Peak Shear Zone.

This gravity feature coincides with a NE trending corridor of quiet magnetic character, superimposed on a regional large deep magnetic anomaly. As stated by Leaman, all these features can hardly be coincidental, and may be indicative of a major basement structure which may have been a focus for mineralising fluids.

2. Regional magnetic high centred at 383 000E 5 392 000N

The magnetic anomaly is a composite feature including a high frequency component associated with outcropping porphyries containing disseminated magnetite and a regional deep effect.

Modelling by Leaman indicates that the regional low frequency effect has to be sourced at depth from an ultramafic slice (see Appendix III, Fig 22). However the writer finds it extraordinary that two quite different magnetic sources should coincide in a background of characteristically low magnetics (see Fig 6), and interprets the entire anomaly to be sourced in a large porphyry plug/sill some of which is exposed. The porphyry option is modelled but discounted by Leaman (see Appendix III Fig 20).

3. Differentiation within the CVC

From the magnetic data fundamental differences are apparent within the CVC (see Fig 6). The two regimes, Boco Siding and Burns Peak/ North Pinnacles are separated by a NE trending feature which runs from the headwaters of the Hollway River to High Point (2km west of Mt Charter).

The SE CVC is characterised by spiky magnetics. This magnetic character is interpreted to be caused by pervasive chlorite-albite-haematite alteration and possibly basic dykes (see MRV Map 2).

The NW CVC is quiet magnetically, associated with the Burns Peak-Pinnacles volcanics which are variably sericite altered and host base and precious metal mineralisation.

The distinctive magnetic character associated with each of these regimes can be seen in Figure 6 and Leaman's profiles in Appendix III and Figs 16, 18 and 19.

The nature of the structure separating these two styles of CVC has been constrained by drilling at the Summit Prospect (EL 44/88)(pers comm Kirsner, 1993). Kirsner indicates that the SE CVC dips west beneath the Hollway andesite, the contact between the two being normal. This association requires that the structure in consideration lies west of here, the most likely contender being the Burns Peak Shear Zone. Magnetic modelling by Leaman(Appendix III, Fig 19) indicates that the magnetically spiky CVC can not extend west beneath the Burns Peak CVC.

Equating this regional magnetic feature with the Burns Peak Shear Zone, enhances the significance of this structure, which extends NE at least to High Point and Leaman (Appendix III) extends it further, equating it with the Jack Fault in the Que/Hellyer area.

4. Prospectivity of SE CVC

The volcanics are un-mineralised except for the barren Boco Siding pyritic alteration zone. Gravity indicates that the volcanics form shallow cover on the Precambrian basement with as little as 300m thickness in the vicinity of Boco Siding (Leaman Appendix III Fig 5). This may indicate that it is unlikely that a significant thickness of prospective volcanics exists at depth in the Boco Siding-Mackintosh Bluff area.

6.5 IP Survey

A pole–dipole induced polarisation and resistivity survey has been conducted over 16.8 line kilometres of the Silver Falls Grid by Scintrex Pty Ltd in February. The survey was not completed due to inclement weather conditions and equipment failure. Survey specifications and interpretations by Neil Hughes are included as Appendix IV. Anomalies are plotted at 1:25 000 scale and can be overlain with the geological interpretation (Fig 5) and aeromagnetic image (Fig 6).

Additional comments on the survey interpretation are discussed below.

ZONE A

A zone of increased chargeability, extending north from the Aberfoyle survey area at Silver Falls. The northern truncation of the zone is coincident with a regional NW trending magnetic feature (see Fig 6). The zone comprises several anomalous responses which may have separate sources, from west to east the interpreted sources are:
- shears which may be splays off the Rosebery Fault.
- haematitic chert (10 750E 10 400N).
- Tyndall Group magnetite and pyrite bearing volcaniclastics.

ZONE B

This chargeability trend is associated with the contact between the Stitt Quartzite and the overlying Southwell Subgroup. This anomaly may be associated with a fault (a significant section of the stratigraphy is missing (see Fig 11) or mineralisation in non outcropping felsic volcanics similar to those at the Silver Falls prospect, which is located 2 kms south along strike.

ZONE C

On a regional scale the anomaly is coincident with a magnetic high, as noted by Hughes (Appendix IV). On the 1:5 000 scale detailed geology (see Fig 7), the anomaly coincides with the contact between siltstones and volcaniclastics within the Southwell Subgroup on lines 12 000N and 12 400N. One of the few primary felsic volcanics within this sequence is located 400m further north on line 12 800N (line not read this survey).

CHARGEABILITY HIGH 10 400N 10 600 - 12 200E

This anomaly is coincident with the outcrop and interpreted down dip continuation of the Tyndall Group volcaniclastics (magnetite and pyrite bearing) on the eastern limb of the Silver Falls syncline. As noted previously the eastern anomalies in Zone A may be associated with the same horizon.

IP anomalies will be further evaluated in conjunction with soil geochemistry and previous IP surveys by EZ and Geopeko.

6.6 Down Hole EM AK1

The Crone Geophysics down hole EM system was used to log the entire length of DDH AK1. Details of the survey and results are included in Appendix V. No off-hole anomalies were detected.

6.7 Soil Geochemistry

470 B/C horizon soil samples have been collected on the grid by hand auger. The majority of soils are residual. The survey was designed to cover extensions of the Silver Falls soil anomaly defined previously by Aberfoyle (Taylor, 1979) and EZ (Mollison,1980). Samples were dried, pulverised and analysed at Analabs for Cu Pb Zn Mn As by AAS. At the time of reporting analyses were not available and will be included in the 1993/94 report.

6.8 Environmental Disturbance

Activities which impacted the environment during 1992-93 have been restricted to maintenance of vehicular tracks and cutting the Silver Falls grid. All gridding was undertaken in strict compliance with the Exploration Code of Practise.

There has been no rehabilitation of areas disturbed by previous exploration this year.

7 EXPENDITURE SUMMARY 1992-93

The expenditure for the 14 month period from 1 March 1992 to 30 April 1993 (in line with the new Annual Reporting period) for EL 2/90 (Boco) is **$187 374** and EL 8/90 (North Pinnacles) is **$23 782**. This brings the total expenditure on EL's 2/90 and 8/90 since their inception to **$439 026** and **$562 333** respectively. A summary of the 1992-93 expenditure statement is presented below.

	EL 2/90	**EL 8/90**
Personnel	42 329	5 182
Travel & Accommodation	2 563	240
Geological Contractor	8 631	5 269
Assays	300	0
Geophysical Consultants	1 450	0
Petrology	717	0
Track Cutting & Gridding	42 443	0
Geophysical Surveys - Airborne (reprocessing)	1 936	0
Geophysical Surveys - IP	737	737
Geophysical Surveys - Gravity	18 236	1 551
Geophysical Surveys - Downhole EM	2 057	0
Surveying	637	0
Drafting Contractors	1 022	427
Other Consultants	4 950	0
Drilling (including access, core processing & storage)	15 110	2 281
Stores & Supplies	3 789	436
Vehicles, Plant & Equipment	4 792	822
Tenement Costs	1 181	276
Computing	3 054	325
Office Running Costs	14 406	4 074
Management Fee	17 034	2 162
Total Expenditure	**187 374**	**23 782**

8 CONCLUSIONS

No new mineral occurrences have been located during 1992–93 but the geological understanding has increased. This will allow future exploration to be more focused.

The most prospective horizon is at the base of the White Spur Formation, which is equated with the Rosebery/ Hercules host and hanging wall sequences.

The greatest exploration potential is considered to exist at the intersection of this horizon with structures which are associated with mineralisation at Burns Peak and trend north into the Boco JV area.

9 RECOMMENDATIONS

1. Infill gridding to cover the prospective package and coincident soil anomalies at the base of the White Spur Formation at North Pinnacles and Silver Falls.

2. Compilation and computerisation of lithogeochemical data from Billiton (regional study), Pasminco and the MRV project. This data will be used to:
   - quantify alteration style and intensity.
   - characterise and substantiate divisions within the MRV.

3. Extend the regional geological understanding to the NE sector of EL 2/90, filling the information gap (MRV cover) between the Silver Falls and Sock Creek areas. Potential exists for both the Que/Hellyer and Rosebery host stratigraphies to occur in this area. Follow up targets defined with grid based soil and rock geochemistry.

10 KEY WORDS

BOCO, SILVER FALLS, NORTH PINNACLES, QUE RIVER, BILLITON, ABERFOYLE, EZ, WESTCOTT ARGILLITE, STITT QUARTZITE, PINNACLES RHYOLITE, WHITE SPUR FORMATION, TYNDALL GROUP, SOUTHWELL SUBGROUP, MT READ VOLCANICS, CENTRAL VOLCANIC COMPLEX, CHERT, QUARTZ CRYSTAL SANDSTONES, TRANSITION SEQUENCE, LEAD, ZINC, SILVER, GOLD, MAGNETITE, SERICITE, CARBONATE, SILICA, GRAVITY, AEROMAGNETICS, INDUCED POLARISATION, RESISTIVITY.

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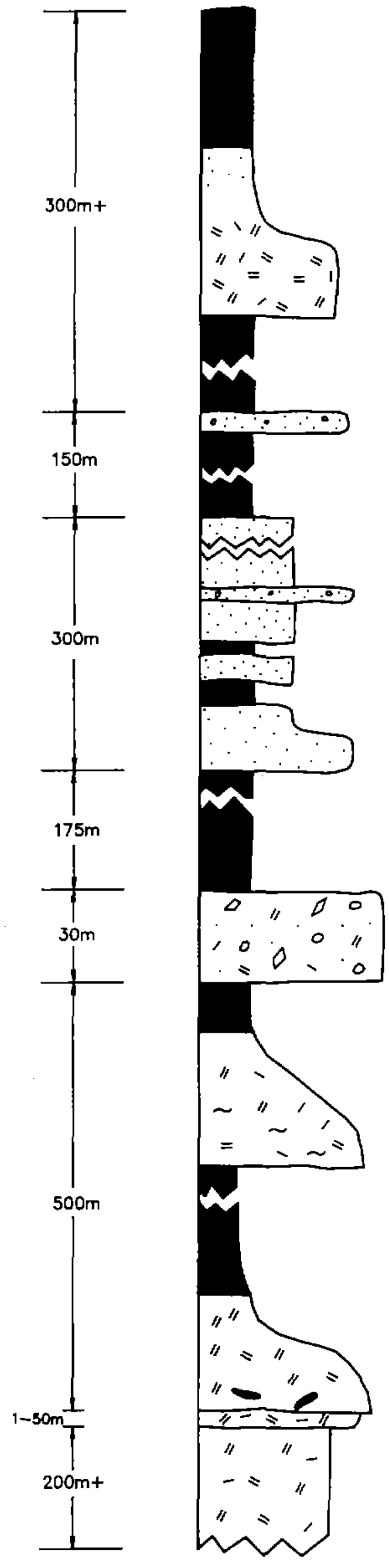


Siltstone with minor felsic mass debris flows and pebble conglomerate.
Provenance metamorphics, chlorite—hematite altered felsic volcanics and ophiolite.
* Magnetite grains in felsic mass debris flows.

Siltstone and pebble conglomerate (as for unit below).

Quartz muscovite sandstone, pebble conglomerate and siltstone.
Provenance metamorphics, chlorite hematite altered felsic volcanics and ophiolites.
Detrital minerals tourmaline, chromite and magnetite.

Siltstone

LYNCHFORD TUFF — TYNDALL GROUP

Volcaniclastic sandstone.
Provenance mafic — intermediate volcanics, pelitic metamorphics and ophiolite
Detrital magnetite.

WHITE SPUR FORMATION

Grey—dark grey siltstones with mass debris flow, graded units, from quartz feldspar crystal lithic — vitric siltstone.
Provenance felsic volcanics.

Quartz crystal sandstone? — quartz grains ≤ 8mm rounded and embayed.

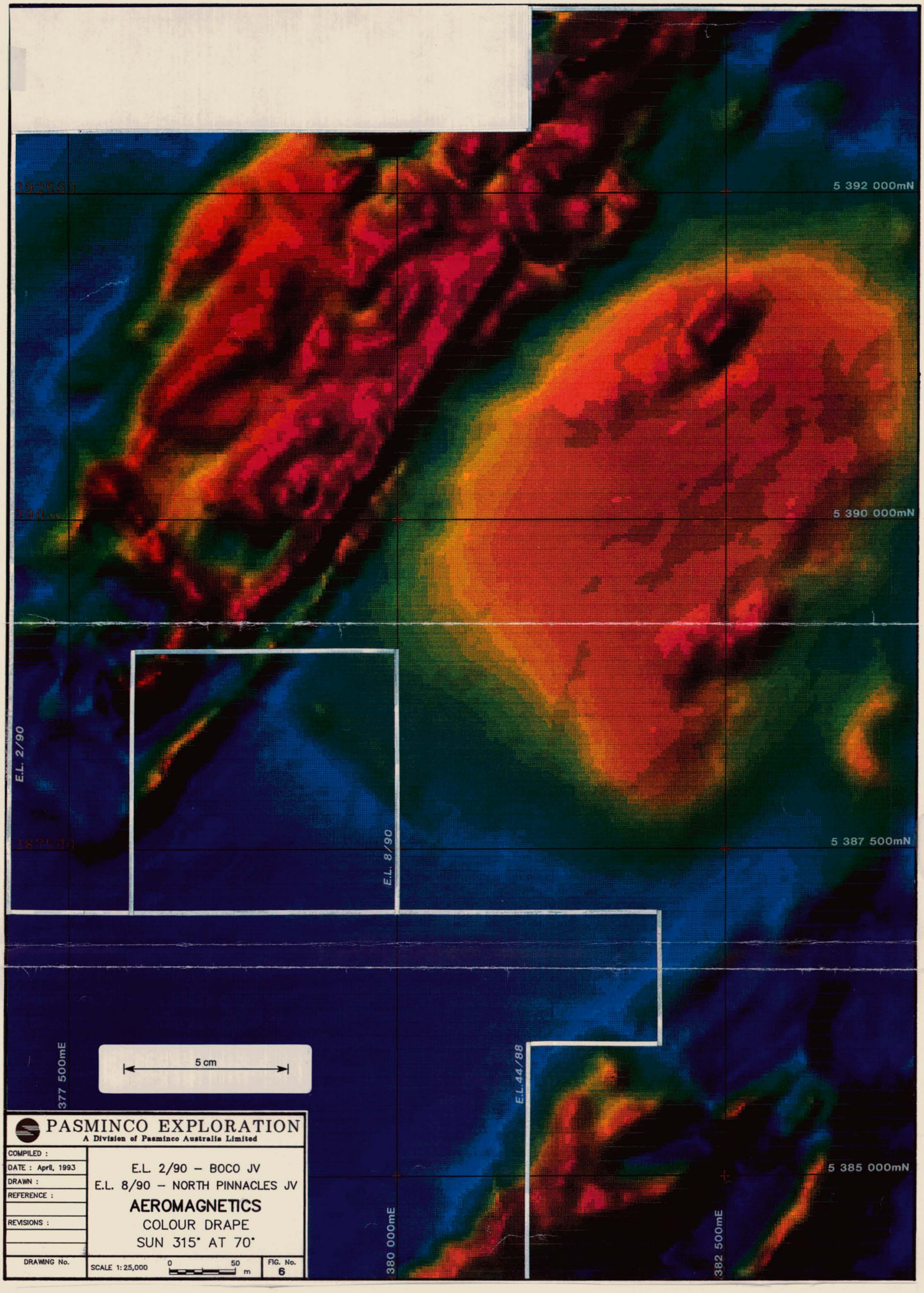
Rhyolite lava, feldspar > quartz phyric.
Host North Pinnacles Pb Ag Au mineralization

BROWN'S TUNNEL PACKAGE ?

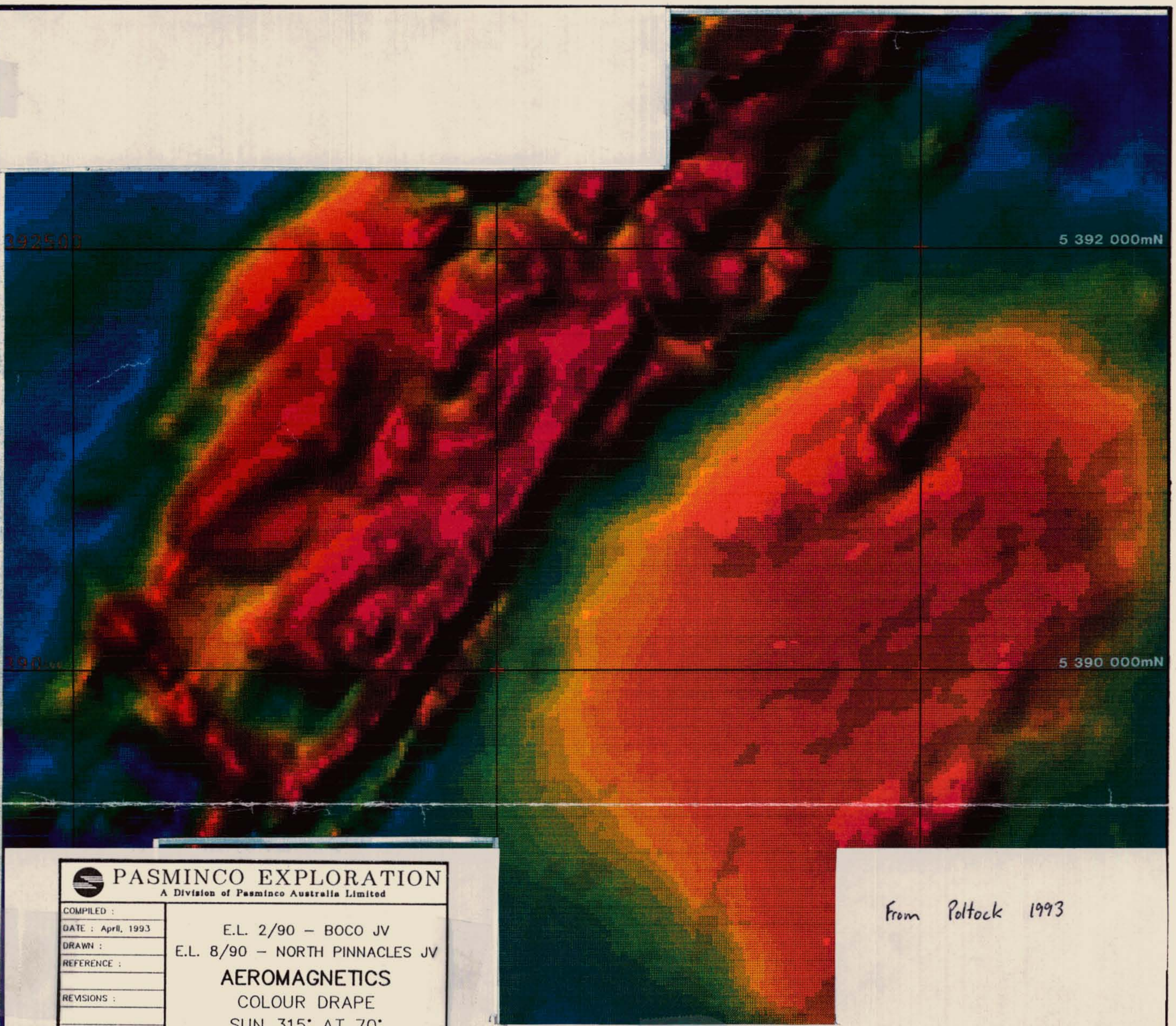
5 cm

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : R.A.P.	E.L. 2/90 — BOCO JV
DATE : April, 1993	E.L. 8/90 — NORTH PINNACLES JV
DRAWN : G.M.B.	SCHEMATIC STRATIGRAPHIC COLUMN
REFERENCE :	EASTERN LIMB OF SILVER FALLS SYNCLINE
REVISIONS :	
DRAWING No. SC_ELSFS	SCALE 1:2000 — FIG. No. 12


5 392 000mN
5 390 000mN
5 387 500mN
5 385 000mN
E.L. 2/90
E.L. 8/90
E.L.44/88
377 500mE
380 000mE
382 500mE
5 cm
PASMINCO EXPLORATION
A Division of Pasminco Australia Limited
COMPILED :
DATE : April, 1993
DRAWN :
REFERENCE :
REVISIONS :
DRAWING No.
E.L. 2/90 – BOCO JV
E.L. 8/90 – NORTH PINNACLES JV
AEROMAGNETICS
COLOUR DRAPE
SUN 315° AT 70°
SCALE 1: 25,000
0
50
m
FIG. No.
6

012043



PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED :	E.L. 2/90 – BOCO JV
DATE : April, 1993	E.L. 8/90 – NORTH PINNACLES JV
DRAWN :	**AEROMAGNETICS**
REFERENCE :	COLOUR DRAPE
REVISIONS :	SUN 315° AT 70°
DRAWING No.	SCALE 1: 25,000 0 50 m FIG. No. 6

From Poltock 1993

APPENDICES

APPENDIX I

ANALYTICAL REPORTS

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

93-3439

012046

Phone (004) 316837 | 14 Thirkell St. COOEE TAS 7320 | Fax (004) 318890

ANALYTICAL REPORT No. 111310.60.08675

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

INVOICE TO:
Pasminco Exploration
P.O. Box 886
BURNIE TAS 7320

ORDER No.	PROJECT
0180	3009

DATE RECEIVED	RESULTS REQUIRED
30/03/92	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
2	16/04/92	1	21

SAMPLE NUMBERS	SAMPLE DESCRIPTION	ELEMENT/METHOD
032949/969	RC Prep : 6P029,P4	Cu,Pb,Zn,Ag/GA140
	RC Prep : 6P029,P4	Whole Rock Analysis/OX408

RESULTS TO:
Mr F Fitzgerald
Pasminco Exploration
P.O. Box 886
BURNIE TAS 7320

RESULTS TO:
Mr L Kirsner
Pasminco Exploration
P.O. Box 886
BURNIE TAS 7320

RESULTS TO:

REMARKS

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.
A.C.N. 004 591 664

93-3439

012047

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	111310.60.08675	16/04/92	0180	1 OF 2

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Al2O3	SiO2	TiO2	Fe2O3	MnO
1	032949	–	–	–	–	15.38	72.3	0.39	1.49	0.40
2	032950	–	–	–	–	10.57	74.8	0.59	5.30	0.05
3	032951	–	–	–	–	14.47	73.2	0.39	2.33	0.02
4	032952	–	–	–	–	10.09	81.2	0.25	2.27	0.04
5	032953	–	–	–	–	17.70	63.0	0.59	4.95	0.60
6	032954	–	–	–	–	16.37	60.0	1.22	9.64	0.39
7	032955	–	–	–	–	18.81	68.2	0.52	1.28	0.07
8	032956	22	1500	81	1	10.20	77.9	0.19	1.55	0.16
9	032957	<2	1850	57	1	16.23	72.3	0.35	1.63	0.04
10	032958	6	425	42	1	11.84	79.1	0.24	1.38	0.07
11	032959	–	–	–	–	14.04	75.5	0.43	1.10	0.01
12	032960	–	–	–	–	13.10	75.0	0.38	2.64	0.08
13	032961	–	–	–	–	12.40	77.6	0.26	1.84	0.25
14	032962	–	–	–	–	11.38	79.9	0.29	1.50	0.01
15	032963	–	–	–	–	10.40	77.8	0.32	3.91	0.14
16	032964	–	–	–	–	12.64	76.0	0.36	2.35	0.17
17	032965	–	–	–	–	11.89	73.9	0.31	2.95	0.43
18	032966	–	–	–	–	12.09	75.6	0.68	1.77	0.03
19	032967	–	–	–	–	12.01	78.5	0.31	1.04	0.02
20	032968	–	–	–	–	13.51	75.9	0.31	0.98	0.01
21	032969	–	–	–	–	7.84	86.2	0.42	0.82	0.01
22										
23	DETECTION	2	3	2	1	0.05	0.1	0.01	0.01	0.01
24	UNITS	ppm	ppm	ppm	ppm	%	%	%	%	%
25	METHOD	GA140	GA140	GA140	GA140	OX408	OX408	OX408	OX408	OX408

Results in ppm unless otherwise specified
T = element present, but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.
A.C.N. 004 591 664

012048

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	111310.60.08675	16/04/92	0180	2 OF 2

TUBE No.	SAMPLE No.	CaO	K2O	MgO	P2O5	Na2O	SO3	LOI	TOTAL	A.I.
1	032949	0.08	1.20	0.20	0.111	5.58	0.03	3.14	100.29	19.8
2	032950	0.04	1.33	2.23	0.085	0.99	0.03	3.70	99.69	77.6
3	032951	0.08	0.62	0.32	0.102	6.04	0.01	2.33	99.90	13.3
4	032952	0.02	3.04	0.56	0.015	0.13	0.01	2.44	100.06	96.0
5	032953	0.12	0.83	0.88	0.089	7.02	0.03	4.10	99.91	19.3
6	032954	0.16	0.51	2.33	0.131	5.61	0.03	3.60	100.04	33.0
7	032955	0.05	3.25	0.49	0.126	4.09	0.03	3.23	100.14	47.5
8	032956	1.29	1.46	0.69	0.028	3.25	0.14	2.93	99.76	32.1
9	032957	0.05	3.44	0.61	0.035	2.93	0.03	2.51	100.18	57.6
10	032958	0.04	2.09	0.40	0.026	3.12	<0.01	1.69	100.04	44.1
11	032959	0.06	2.12	0.31	0.011	4.11	0.01	2.58	100.23	36.8
12	032960	0.07	2.03	0.31	0.054	3.73	0.02	2.38	99.77	38.1
13	032961	0.08	1.55	0.31	0.034	4.39	0.10	1.68	100.47	29.4
14	032962	0.03	2.56	0.48	0.024	1.79	0.01	2.31	100.30	62.6
15	032963	0.06	1.05	0.17	0.026	3.73	0.03	2.56	100.19	24.4
16	032964	0.11	1.20	0.22	0.054	5.04	0.02	1.85	99.96	21.6
17	032965	1.31	1.08	0.39	0.069	4.98	0.02	2.96	100.25	18.9
18	032966	0.02	1.35	0.57	0.137	0.09	0.04	7.46	99.81	94.6
19	032967	0.07	1.57	0.37	0.036	3.54	0.02	2.66	100.18	35.0
20	032968	0.05	1.96	0.44	0.023	2.43	0.01	4.30	99.92	49.2
21	032969	0.01	2.02	0.53	0.023	0.09	<0.01	1.83	99.81	96.2
22										$\frac{K_2O + MgO}{K_2O + MgO + Na_2}$
23	DETECTION	0.01	0.01	0.01	0.005	0.05	0.01	0.01	0.01	
24	UNITS	%	%	%	%	%	%	%	%	
[illegible]	METHOD	OX408	OX408	OX408	OX408	OX408	OX408	OX408	OX408	

Results in ppm unless otherwise specified
T = element present but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.
A.C.N. 004 591 664

012049

Phone (004) 316837 | 14 Thirkell St. CODEE TAS 7320 | Fax (004) 313890

ANALYTICAL REPORT No. 111310.60.09384

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

INVOICE TO:
Pasminco Exploration
P.O. Box 886
BURNIE TAS 7320

ORDER No.	PROJECT
0128	3009

DATE RECEIVED	RESULTS REQUIRED
19/03/93	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
2	06/04/93	1	5

SAMPLE NUMBERS	SAMPLE DESCRIPTION	ELEMENT/METHOD
34904,34918,34919,34921,34935	RO Prep : GP029,P1	Cu,Pb,Zn,Ag,Mn,Bi/GA140 Au,Au(S)/GG309 Ba,Sb,Sn/GX401 As/GA114

RESULTS TO
Roger Pollock Geological Pty Ltd
Mineral Exploration Contractor
C/- Post Office
WILMOT TAS 7310

RESULTS TO
Mr Fergus Fitzgerald
Pasminco Exploration
P.O. Box 886
BURNIE TAS 7320

RESULTS TO

REMARKS

AUTHORISED OFFICER

012050

ANALABS

A Division of Inchcape Testing Services (Australia) Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	111310.60.09384	06/04/93	0128	1 OF 2

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Mn	Bi	Au	Au(S)	As
1	34904	12	32	68	<1	241	<10	<0.008	<0.008	5
2	34918	5	35	100	<1	735	<10	<0.008	–	5
3	34919	7	22	83	<1	866	<10	<0.008	–	4
4	34921	5	5	144	<1	1076	<10	<0.008	–	4
5	34935	12	43	43	<1	246	<10	<0.008	–	35
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	2	3	2	1	3	10	0.008	0.008	[illegible]
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25	METHOD	GA140	GA140	GA140	GA140	GA140	GA140	GG309	GG309	GA14

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Testing Services (Australia) Pty. Ltd.
A.C.N. 004 591 664

012051

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	111310.60.09384	06/04/93	0128	2 OF 2

TUBE No.	SAMPLE No.	Sn	Sb	Ba						
1	34904	<3	5	41						
2	34918	<3	<3	458						
3	34919	4	3	251						
4	34921	4	<3	1218						
5	34935	<3	<3	344						
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	3	3	10						
24	UNITS	ppm	ppm	ppm						
25	METHOD	GX401	GX401	GX401						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

AUTHORISED OFFICER

APPENDIX II

SAMPLE RECORD AND ANALYTICAL DATA SHEETS

ROGER POLTOCK GEOLOGICAL PTY. LTD.

CLIENT PASMINCO EXPLORATION
PROJECT EL 2/90
PROSPECT SILVER FALLS

SAMPLE RECORD AND ANALYTICAL DATA SHEET

LABORATORY ANALABS
SAMPLE TYPE ROCK - LITHOGEOCHEM

COLLECTED BY L.W. KRSNER
DATE DISPATCHED:
DATE RECEIVED: 16/4/92

A 28306

SAMPLE NUMBER	LOCATION		DESCRIPTION	ANALYSES Cu	Pb	Zn	Ag					
32949	5389185 N	376995E	Sst feldspath, <mica									
32950	5389170N	377140E	Sst, feldspth, m-cgnd + lithics.									
32951	5389195N	376970E	Sst feldsp - biotite + lithics <seric									
32952	5389195N	376945E	Qtz feld porph?? pale grey weath									
32953	5389220N	376905E	Sst - wacke, qtz feld xt, siltst clasts									
32954	5389270N	376860E	Sst feldsp, m-cgnd, poorly sorted									
32955	5389340N	376890E	Qtz feld cryst rock sst or porph?									
32956	5389390N	376865E	Rhyolite, fg, silic galena veinlets	22	1500	81	1		MAJOR	ELEMENTS		
32957	"	"	Cong/brecc?? silic minor galena	<2	1850	57	1		SEE	Appendix ...		
32958	"	"	Sst - rhyolite, z/fract, sericitic	6	425	42	1					
32959	5389455N	376900E	Qtz feld cryst sst - intrusive									
32960	5389460N	376900E	" " " " "									
32961	5389490N	376900E	" " " " " Mn									
32962	5389535N	376900E	" " " coarsegnd " "									
32963	5389615N	376890E	" " "									
32964	5389675N	376675E	" " "									
32965	5389750N	376900E	" " "									
32966	5390270N	377230E	Sst feldsp mica med- poorly sorted									
32967	"	377160E	Rhyolite fgnd									
32968	"	377090E	" "									
32969	"	376975E	Sst micaceous									

010203

ROGER POLTOCK GEOLOGICAL PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

CLIENT: Pasminco Exploration
PROJECT: EL 2/90, 8/90
PROSPECT: Silver Falls

LABORATORY: Analabs
SAMPLE TYPE: Rock

COLLECTED BY: R Pollock
DATE DISPATCHED:
DATE RECEIVED:

A 28305

SAMPLE NUMBER	LOCATION		DESCRIPTION	Cu	Pb	Zn	Ag	Au	As	Ba	Mn	Bi	Sb	Sn
34904	5389550N	377700E	Hematitic chert.	12	32	68	<1	<.008	5	41	241	<10	5	<3
34910	5387290N	375450E	Brecciated fine grained felsic c̄ carb' silic' altn + dissem py	5	35	100	<1	<.008	5	458	735	<10	<3	<3
34919	5387290N	375450E	Qtz phyric felsic + silic' carb' altn'.	7	22	83	<1	<.008	4	251	866	<10	3	4
34921	5380275N	378750E	Volcaniclastic conglom + carb' fragments + sph??	5	5	144	<1	<.008	4	1218	1076	<10	<3	4
34935	5389640N	381225E	Felsic mass flow conglom + silic carb altn + py clasts + dissem py.	12	43	43	<1	<.008	35	344	246	<10	<3	<3

012054

APPENDIX III

LEAMAN GEOPHYSICS APRIL 1993 INTERPRETATION UPDATE
BURNS PEAK - NORTH PINNACLES RIDGE REGION
EL 44/88, 2/90, 8/90.

LEAMAN GEOPHYSICS
Survey Review, Specification, Reduction, Interpretation
Gravity, Magnetic and Seismic Methods
Structure and Prospect Evaluation

Registered office:
3 MALUKA STREET, BELLERIVE, TAS. 7018
All correspondence to:
GPO BOX 320 D, HOBART, TAS. 7001
Telephone: (002) 44 1233
Fax: (002) 44 6674

INTERPRETATION UPDATE
BURNS PEAK - NORTH PINNACLES RIDGE REGION
EL 44/88, 2/90, 8/90

for
PASMINCO EXPLORATION

by
D.E. Leaman

April 1993

PINNACLE

012057

CONTENTS

LIST OF FIGURES

012058

INTRODUCTION

This report considers aspects of the geological structure in the Burns Peak - North Pinnacles - Silver Falls area some 10 km north of Rosebery in western Tasmania. The region examined forms parts of EL 44/88 (Burns Peak), EL 2/90 (Bulgobac) and EL 8/90 (The Pinnacles). The location of the area examined and the relationships of these licence areas is shown in Figure 1 which presents the current, accepted public domain interpretation of the geology (Mines Department Mount Read Project Mapping).

Pasminco Exploration requested a brief review of current geophysical data in order to effect an update of previous interpretations (e.g. Leaman, 1990a, b; 1991a, b). The review has considered revised and improved gravity and magnetic databases and suggestions from recent mapping.

New mapping, by Roger Poltock for Pasminco Exploration, has been restricted to the North Pinnacles zone and, like the infilled gravity data base, the information has only been available since April 1993. Indeed, the final gravity traverse was not reduced until April 23. These delays and restrictions have limited the extent of this review given a licence renewal reporting date of May 8.

Some particular issues were posed for examination.

1. SILVER FALLS - NORTH PINNACLES. Recent mapping and interpretation by R. Poltock has implied a stratigraphic control on mineralisation north of the Burns Peak zone which extends into the Silver Falls area. Is such a structure and pattern feasible and continuous? Do the potential field data support such ideas?
2. THE ORIGIN OF THE LARGE MAGNETIC ANOMALY CENTRED AT 382 000 mE, 5390 000 mN. This feature dominates and distorts the magnetic field over a wide area. Various options for its source have been canvassed, including a porphyry sill or plug. Which are most likely?
3. THE RELATIONSHIP BETWEEN HOLLWAY HOST SEQUENCES AND CENTRAL VOLCANICS. Does the host sequence unconformably overlie or structurally or otherwise underlie the main body of volcanics? And are these structures related to the Pinnacles block?

Consideration of these issues forms the body of this report in so far as available time and data have allowed. Additional magnetic data has been recently acquired by Pasminco Exploration in the areas both east and west of the data set used, including the Silver Falls region. This has not been released by the contractor at the time of writing.

PREVIOUS WORK

Some previous work, outlining data available and its preliminary interpretation, is available. This report considers any necessary or essential refinements to these interpretations required by evolution of ideas, data bases, data coverage or new mapping.

All previous work (pre December 1991) was based on the extant gravity data base, utilised in both total Bouguer and residual Bouguer forms, and observed magnetic data at a nominal clearance of about 100 m (effectively 120 m).

Aspects of this previous work relevant to the particular issues (see Introduction) posed for this study are outlined below.
Figures 2, 3 and 4 have been drawn from Leaman (1990a) study of EL 44/88. Figures 2 and 3 indicate the nature of the magnetic field and the primary elements of its interpretation. The gross regional effect generating almost 300 nT is due to the large magnetic feature centred north of the sections (Issue 2) and is the bane of any detailed interpretation in the region. All previous interpretations have been forced to consider side aspects of this feature and attempt to remove the effects in order to examine the detail - spiky effects associated with the volcanics. Unless this can be done adequately there will always be some doubt attached to dip evaluations within the volcanics. No previous interpretation for Pasminco has been able to consider the entirety of the regional source due to survey and licence fragmentation. (This report represents a first attempt to redress this situation). The interpretations indicated that the gross effects would be best satisfied by a deep, very high contrast magnetic source. Only ultramafics appear to satisfy the required property conditions. Consideration of the more detailed aspects of the profiles then led to a view that the volcanics were depth limited and were present in wedge shapes with internal units dipping steeply to the wedge cut off. This pattern is consistent with thrusting on a large scale. While elements of the volcanics were inferred to be relatively non magnetic some discrete units are modestly magnetic. The anomalous responses; a generally noisy and sub linear pattern is associated with the volcanics, imply that these units virtually outcrop and yet they have yet to be identified and their properties explained by susceptibility surveys. This paradox must be resolved. Some volcanic units are clearly magnetised. But why? And what is the lithology involved?
These same interpretations imply that the Central Volcanics might well overlie the Hollway host sequence (Issue 3) although at the scale presented this is unclear. The Rosebery Fault does not appear in these sections and it may be relatively unimportant in the regional scheme in terms of its dislocation of major or magnetic units. Figure 4 stresses this view by suggesting some major cross cutting regional trends and repeated detachments within the region. Only in the Burns-Pinnacles area (Issue 1) does this pattern break down. The mapped volcanics in this area lack strong magnetic responses, there are no strong trends of any sort north of the main detachment (as described in Figure 4) and mineralisation is isolated.

The reason for these changes was (and perhaps still is) far from apparent.

Leaman (1990b) took a somewhat more regional view of the volcanics east of Burns Peak. Figures 5 and 6 demonstrate this. Figure 5 enhances the view shown in Figure 4 to quantify the thickness of volcanics present in the implied thrust and fold wedges and to nominate the likely location of the detachments. In this view the principal trend from near 376/5381 to 383/5387 (and beyond) is presented as a compound detachment with two structures in the Burns Peak zone. One of these would impose an eastward facing at the base of the Hollway Andesite (Issue 3). The other would isolate the Pinnacles rhyolite and suggest synclinal folding in order to explain the negligible response of this block of volcanics (Issue 1). The gravity interpretation shown in Figure 6 reinforces many of these characteristics. The volcanics are thin and wedged but there is a major change in gross structure near Burns Peak. Regional granites dominate the gravity field and must be included in all assessments.

Leaman (1991a) provided a further regional view of the area NE of Burns Peak. This is suggested in Figure 8. The location of regional profiles is shown in Figure 7. Leaman (1991b) also included additional regional assessments and incorporated some refinements. No other, or subsequent, evaluations have been undertaken even though the data bases have been greatly expanded, corrected and integrated. Figure 9 presents the latest view. Its location is shown in Figure 7. Figures 8 and 9 stress the regionally elevated nature of the magnetic field NE of Burns Peak even though neither profile offers a view of the main anomaly (Issue 2). Both solutions imply a strongly magnetic base to the section implying properties consistent with magnetic basalts or volcanics comparable to the Crimson Creek Formation <u>and</u> at least discontinuous slices of higher contrast - presumably ultramafics. These mafic units are mass limited and it is not possible to include large volumes of basalts. Both gravity sections have been anchored on Devonian granites for density and base level reference. Both sections stress the thin and wedge-like character of the volcanics and the existence of a deep trough or section near, or west of, the Pinnacles ridge (Issue 1). It will be noted that in each case it is the gravity interpretation which is most informative overall - but this is only achieved due to the independent control of one or two horizons by the magnetic analysis. Neither method should be used in isolation.

Leaman (1991b) attempted to consolidate, within the context of EL 2/90, the regional setting which appeared to be indicated by this series of limited interpretations and its impact on exploration targetting and explanation of known mineralisation. Figures 10 and 11 summarise the conclusions.
Figure 10 provides a refinement of the volcanic wedge form with its general confirmation of east facing detachment and concealment of half grabens containing Lower Cambrian, and much more magnetic, rocks. Ultramafics, effectively as a sheet, marked base of section. The magnetic profile again provided a side-swipe sample of the major central magnetic anomaly (Issue 2) and this is clearly linked to both

quartz porphyries (outcropping) and concealed ultramafics. The latter were considered the critical element. This interpretation is terminated east of the Pinnacles Ridge near the feature which had been termed a thrust limit (Figures 4, 5) and which is labelled a rift edge (Figure 11). This apparent contradiction reflects both the impact of the modelling completed and the slowly improving data bases, especially the gravity coverage. But there is no contradiction. Simply that the thrust front, or one of them, involving Central Volcanics has overlapped a major structural element in older or contemporaneous rocks. Note that even if the rocks are all of similar ages the volcanics are restricted to the blocks SE of the major rift stages and have been displaced from a zone in which basement was always high into a region where it was depressed due to extension. Leaman (1988) suggested that this zone also marks the limit of shallow Tyennan type basement and onset of thick Oonah type basement and that this boundary marks a primary rift onset structure. Figure 10 expands this view to suggest that this older structure has been greatly enlarged during the Cambrian and that the extension was focussed about it. The volcanic piles appear to have accumulated in the relatively shallow depressions inboard of this most active zone. They have been translated westward subsequently. Note that Figure 11 suggests a major rift trending NE with a width approximately equivalent to the distance between Silver Falls and Burns Peak (Issue 1).

This outline of previous work stresses some consistencies and some contradictions but no coherent study had been undertaken. The major problems are related to just what happens eastward from Silver Falls to Burns Peak and then into the main block of Central Volcanics. Can correlations be made? Just what is the mineralisation associated with? The key to all this lies in the position of the Pinnacles Ridge which has been assumed to be a piece of Central Volcanics and yet which has very different properties (see magnetics) and which lies within the axis of a major structure (magnetics) which is almost certainly a rift (gravity). This is Issue 1. Can it be resolved?

NEW DATA AND INNOVATIONS

At the time of writing new detailed aeromagnetic surveys adjacent to the Pinnacles area had been completed on behalf of Pasminco Exploration and results were expected. Late receipt of this data has limited deductions near Silver Falls. Other magnetic data have been reviewed and corrected for terrain effects and replotted at the realistic altitude of 120 m (Figure 12a) or as a residual after removal of a 1300 m level continuation (Figure 12b). The latter has the effect of sharpening and clarifying shallow source distributions but may be misleading to model due to uncertainties about what has been removed. None of these enhancements were available at the time of earlier studies. The relationship between basic geology and magnetic field is shown in Figure 12c.
Gravity coverage has been greatly improved since 1991 and it is used here in mantle-corrected form (Figure 13a, b) as a residual. Raw

Bouguer compilations obscure detail within the data set and provide little indication of anomaly relativities. No raw compilation should be used for image or other qualitative analysis and should only be modelled if a whole crustal element is also included.

The differences between the magnetic presentations should be noted. The residual version is more detailed and much of the large central anomaly has been removed. The removal is not complete and some ghosts persist. This reflects the complex frequency response of the feature and the likelihood that its source covers a sizeable depth range.

Important elements of the geophysics of the region may also be seen in Figure 14 which offers superposition of the gravity and magnetic data sets. This stresses some of the conflicts and agreements in the data sets.

The upgraded interpretation described below incorporates the best elements of the available data sets; using the observed and corrected magnetic field where overviews and relativity are required and the residual magnetic field where detail is sought. This leads to a shift in the relative zero position in both the maps and models and it is not valid to compare the curve fit parameters between each type. Each class must be fitted consistently as separate entities. All gravity interpretation uses the residual field but is also linked to the effect of the nearby granitoids in order to minimise ambiguity. This technique has been little used in western Tasmania to improve the resolution of the data set but the development of reasonably accurate granite models (Leaman & Richardson, 1989; unpublished research by Leaman Geophysics since 1990) now allows generation of second order refined residuals. This technique has been tested on the Rosebery Mine Lease.

Recent mapping in the Pinnacles area by R. Poltock has also led to some review of the stratigraphic correlations in the area and the structural setting. These are summarised in the sketch section provided in Figure 15. Although there is some doubt as to the exact position and associations near the Rosebery Fault the strongly magnetic character east of Silver Falls and north of the ridge are linked with rocks considered to be comparable with the Comstock Tuff and Tyndall Group and that these may overlie an equivalent to the White Spur Formation as defined south of Mt Read. The host sequence is considered to be stratigraphically controlled at the base of this sequence and the phyric rhyolite of the ridge forms and anticline. Note that this concept directly disagrees with the ideas shown on Figure 5. It is proposed that both the host sequence and underlying volcanics change in thicness westward such that the volcanics virtually disappear. Other Cambrian rocks underlie the faulted zone. These concepts, Issue 1, are directly tested below.

INTERPRETATION

The following discussion provides introductory comments based on previous work and direct implications from the data sets as now consitituted and then examines some of the particular characteristics relevant to the issues defined for study. A select group of profiles has then been examined in order to resolve some of the issues.

GENERAL COMMENTS

The Silver Falls-North Pinnacles region

The Pinnacles region is magnetically quiet with the exception of the belt E and NE of Silver Falls. Very quiet. The character of the magnetic field is unlike that to the SE of Burns Peak, or NE of Silver Falls. This quiet-zone extends NE from the Rosebery Fault, and perhaps 1 or 2 km west of it, at 5382 to 5388 000 mN. The northern and southern limits of the quiet zone are exceptionally well defined (see Figures 12 and 14).
The northern boundary of the undisturbed field follows the mapped boundary of nominated Tyndall Group of Poltock and this view is much more consistent than any previous mapping - including that shown in Figure 1. Poltock's mapping may be suspect due south of Silver Falls where the folded unit trends N-S and may be offset. The magnetic field would suggest that the dislocations and arrangements are more complicated than shown in the sketch map now available. There is no doubt that this unit can be mapped magnetically.
The southern boundary is more complex. It is marked magnetically as a correspondence with the limit of mapped Central Volcanics although the exact limit of volcanic rocks or their correlates may be in some dispute. The southern boundary cuts across the exposure of the Hollway andesites immediately south of Burns Peak.

The northern and southern boundaries so well defined magnetically are essentially parallel but it is the southern boundary which attracts most interest at this time. Its orientation - as defined magnetically - trends directly to the Jack Fault system of the Que-Hellyer Block. I suggest that this feature is of profound exploration potential and interest. It has, after all, proven mineralisation at each end and its intersection near the Charter Fault may also be mineralised. The zone near 388 200 mE, 5391 500 mN should be reviewed.
(Given these associations some thought may also need to be given to the precise origin of the northern boundary which appears to be stratigraphic, or whether somewhere nearby there is something more fundamental. It will be less well known and perhaps covered due to limited access, basic geological knowledge or Tertiary cover).

But what is this magnetic feature? What is the structural or lithological cause? Why are the volcanics terminated or controlled by it or near it? Why is it so straight?

But, as with all rules, there is an exception. The volcanics of the Burns-Pinnacles Ridge volcanics, which have been directly correlated with the Central Volcanics, lie north of the southern feature. Why?

How? And why are these particular volcanics so magnetically bland? So bland the effect is distinctive. An effect which persists only to the projection of the southern trend a little north of Mt Kershaw.

The last listed question draws attention to a series of enigmas. The volcanics of the Central Volcanics are variably magnetised. Many anomalies are generated by them. *Most are produced at shallow depths* - presumably the base of weathering - with an implied susceptibility of about 0.0003 cgs. This is at least an order of magnitude greater than the normal peak values observed. Most property determinations are consistent with the implications of the Pinnacles Ridge rocks not the main complex. Why? There is no doubt about the anomalies, nor their implied source and depth limits. Unless we are comparing chalk and cheese. Are there perhaps two volcanic sequences?
Most properties currently used for appraisal and control within the volcanic sequences have been derived from outcrop and drilling on the west face of Mt Black and north face of Mt Hamilton and Mt Read. Both areas are remarkable for their high relief, large regional magnetic anomalies and negligible variations in shallow volcanic properties. The contrasting characteristics of smooth and noisy magnetic fields can be seen across Mt Black. Further the more quiet zones can be correlated with those regions shown in Figures 5, 6, 8 and 9 to contain thin volcanics. *Are we really seeing something else in this magnetic response pattern?*

Is there something fundamentally different between the main volcanic block north of Lake Rosebery and that north of Burns Peak? The possible setting of the Pinnacles material has not been discussed in previous interpretations.

The dominant magnetic anomaly in the region is centred on 383 000 mE, 5392 000 mN but is located between the regional magnetic features described above. The anomaly is crudely circular and its centre lies about midway along the quiet magnetic corridor between the Pinnacles Ridge and the Mt Charter Fault. The feature is large and distorts all other anomalies across a radius of about 8 km.
The relationship between this feature and the quiet magnetic corridor seems too definite to be coincidental.
Consideration of the gross features of this anomaly suggests that its source cannot lie near surface since there is nothing known with the requisite distribution. These does not exclude the possibility that the exposed quartz porphyries in the region may well contribute to the effect. Correlation of porphyry exposure with variations demonstrates that these rocks do contribute high frequency components within the magnetically quiet belt but seem quite unable to account for the overall effect (see also Leaman, 1991b).

The linkage between these first order magnetic elements may prove crucial for understanding the evolution of the region and any mineralising foci.

No previous analysis has, however, considered a complete profile *across the crest of this anomaly and estimated the likely source* distribution on that basis. More limited views (e.g. Figures 2, 3) or partial regional views across the side of the feature (Figures 8, 9, 10) have implied ultramafics at depth.

The Hollway Sequence relationship has been mentioned in connection with each element above. The rocks of the package *appear* demagnetised but this may be *their* normal state. Certainly the properties are distinctive when contrasted with other volcanic members SE of Burns Peak. Perhaps as important is the fact that this group of materials lies north of the southern margin of the magnetic corridor and thus within the quiet zone.

I believe all these characters to be related and to represent a rift essentially filled with variable and volcaniclastic sediments, probably locally lacking in volcanic elements, and, near the margins an abundance of mafic volcanics. These certainly occur at the NE end of the magnetic corridor near Que River. Only NE of the Charter Fault do these offlap the trough edges.

This model could pose the option that the large magnetic anomaly is due to frozen upwelling of mafic material directly related to the rift system. But is the scale inappropriate for such a solution?

But if a rift solution is correct how do the materials relate across the margins? And when was it active - pre, post or syn Central Volcanics?

This preliminary discussion has utilised only the magnetic data with their strongly defined and distinctive lineaments. What do the gravity data imply?

Raw Bouguer anomaly maps do not provide any clear indication of structure due to distortions generated by the continental margin - mantle gradient. The residual version of the data base compensated for this distortion (Figure 13) reveals a number of features which can be correlated with the magnetic survey. But there are many apparent inconsistencies.

If we consider the belt of subdued magnetic field we find that the strongest positive gravity anomalies lie along the western and northern margins. A distinct 120 degree corner in the gradients may be noted at 377 000 mE, 5387 000 mN. This correlates well with the magnetic data and the geological data base.
The northern magnetic gradient is followed approximately but the gravity gradients tend to slip northward by a series of offsets and do not form a single coherent element as the magnetics might suggest. This indicates that the structure is complex and compound and only the shallowest elements are fairly straight. The magnetic and gravity gradients do overlap at 383 000 mE, 5394 000 mN which is the northern limit of geological mapping of reasonable quality.

The southern gradient is much less clear gravimetrically but there are hints between 377 000, 5382 000 and 390 000 mE, 5391 000 mN.
Why should this be so if there is a marked magnetic dichotomy in evidence?

Consideration of all models to date (previous work) and for this report shows that the regional granites warp even the refined gravity map shown in Figure 13. For example, there are systematic deviations of -2.4 to -5.1 mgal and -2 to -5.6 mgal along the modelled line at 5387 500 mN due to the Heemskirk - Granite Tor and Meredith Granites respectively. The net deviation of this interaction varies between -5 and -7 mgal between 372 and 390 000 mE. Two mgal does not seem a large amount for the range but the effect hinges to both NW and SE and the primary range in the residuals is only -3 to +6 mgal. In this context 2 mgal is about 25% variation. More than enough to deform gradients and subtle variations.

Regardless of the effect of the granites and the implied further refinement this forces on any serious analysis the result can only be significant is there is some fundamental difference in the nature of the northern and southern limits of the magnetic zone - or rift, if that is what it represents. This difference may be linked to the absence of Oonah type Precambrian SE of the axis of the rift. The thinner cover and siliceous nature of the Tyennan class Precambrian would certainly modify the pattern as observed, and as inferred in Figures 6, 8 and 9.

The gravity data also draw attention to the large number of near N-S elements which disrupt the transverse trends, or which occur between them. Some of these are indicated in the magnetic cover but all are subtle and easily lost in the noisy grain of most of the survey. One of these N-S elements defines the axis of the Pinnacles Ridge. Others occur near 380 500 mE, 5384 500 mN north of 5389 000 mN or at 380 000 mE at about 5385 000 mN. The proportion and significance of these gradients is uncertain. N-S trends dominate regional trends in western Tasmania as seen from the standpoint of the exposed geology and yet this is far from the case when the gravity field is reviewed. Some near E-W, NE or NW trends are more important. This might suggest that the surface character is recently (Devonian) imposed and not a true indication of fundamental or basement geology.

Some of these subtler issues may well be clarified by refinement of the residual gravity map. Assessment of granite effects has, to date, been limited only to long line modelling and compensation and has not been applied on an area basis which would generate a new map. It is difficult to imagine quite how the relatively modest variations would alter the entire map. But, if this data set is to be used in image presentations in association with the magnetic data or surface geology this may well be an essential adjustment.

Meanwhilel, what does the quiet magnetic zone represent? Previous modelling has indicated complex structuring and thickening of the Cambrian sedimentary sequences in its vicinity. Much of the primary magnetic field has been linked to ultramafics which are known to form a structural veneer (at least) on basement to the west. There was no reason to doubt these inferences on the basis of information in existence prior to this update.

ISSUE 1: SETTING OF NORTH PINNACLES RIDGE

The setting of the North Pinnacles Ridge has been examined in both regional and local contexts using the current corrected and detailed data sets. This has been done in order to confirm or deny implications from earlier work and to test some structural variations actually suggested by the distribution of anomalies as well as test the concept proposed by R. Poltock and sketched in Figure 15.

A regional setting is essential. Without it there is no possibility of resolving the many ambiguities this complex and ill-defined geology can pose given that the potential fields are in themselves inherently ambiguous unless rigorously employed.

Two profiles have been selected for detailed review, lines 7295 and 3875.

LINE 7295 is a NW-SE profile extending from 372 000, 5395 000 to 390 000 mE, 5380 000 mN. It begins at an outrigger exposure of the Meredith Granite and ends within view of the major exposures of the Granite Tor Granite such that the latter can be fully defined in terms of the end of the profile. The modelling is thus anchored to granite at each end. Density contrasts and geometries are thus readily fixed into quite small ranges.
The interpretation of this profile is shown in Figure 16.
This interpretation may be compared directly with those of Figures 6 and 8 as a direct successor. Any differences are in style and detail and not general concept. No other general concept has been found which will satisfy BOTH fields.
The general change in basement type is shown to occur just NW of Pinnacles and the thin volcanic wedges of the Mt Block area have been confirmed. The model also suggests a single tectonic style for all the blocks; namely asymmetric rifting and extension and later overlapping compression at high levels.
The implied Tyndall Group correlate is shown in section in the style of Poltock's section and while this dominates the magnetic field it is inconsequential gravimetrically. But there must be another block of material beneath and to the east of these exposures in the very zone which is magnetically quiet. Examination of the requirements of the gravity balance shows that any materials present must be less dense than the "normal" Dundas Group or volcaniclastics and certainly not volcanic in composition or density. The magnetics confirms that this is so even though limited burial (> 1 km) might disguise any magnetic response. The real indicator is provided by the absence of response by the Pinnacles material itself.
The magnetic model assigns a small contrast to this box-like slab of sedimentary material but the profile sideswipes the large central anomaly and other explanations may be more likely. The assigned susceptibility should be considered an absolute maximum; zero is more likely given the following discussion and Figure 10.
For the first time, however, a regional section can be created which contains all the elements of previous work and an explanation of the belt of quiet magnetic field - and a rift filled with sedimentary rocks. All these elements are coupled to show how the volcanics of

of the Central Volcanics Complex structurally overlap the margin of the rift. The issue here thus becomes a matter of age or structural relationships. Is this an unconformable or structural overlap?
If it is stratigraphic then it might be possible to find or predict the presence of further volcanics beneath the fold incorporating Tyndall Group, but above the rift onlap, on the northern side of the structure.
But if structural then some very different age and correlation, indeed genetic, issues are raised. These would include such matters as whether the volcanics piles are the same age as the rift sedimentation and perhaps only the upper members contain obvious volcaniclastics.
There is also the suggestion that the change in basement composition and structural control may be axial to the structure and hence the controlling feature in its development.
The implications of these matters are far reaching and might well do much to explain the differences in sedimentation and lithology long known to occur to the NE of Pinnacles Ridge, as near the Charter Fault and west of the Que River Mine.

Some of these topics have been considered in more detail along LINE 3875 (from 372 to 390 000 mE at 5387 500 mN).
Figures 17 and 18 present some of the options which may be seriously considered. Although the models have a substantial depth range the detail evident in Figure 15 is recognisable in the western half of the profile.
Figure 17 illustrates some of the issues as seen from the gravity viewpoint. The concepts illustrated have been derived from a translation of Figure 16. Note that the midpoints of each line mark the approximate intersection of the two profiles and that they should, therefore, be consistent at that point.
It should be noted here that the observed profile for line 7295 (Figure 16) is the presented residual from Figure 13 while that shown in Figure 17 is not. If Figure 17 employed the natural residuals it would not be possible to derive this model or lock it to line 7295 with the same curve fit parameters. This is because one line includes granites and the other does not. Consequently the effect of the surrounding granites was calculated for all the observation points along profile 5387 500 mN and the residual values were compensated for the deviation. Any resulting model calculation can thus proceed on the basis that no granite is involved (the effect has been incorporated in the "observed" profile) and the two profiles can be interlinked as a cross test.
When the same properties and implications are linked it is found that the more detailed gravity profile cannot be completely sustained by the regional model. Such a model is adequate to east and west of the Pinnacles Ridge but not in its immediate vicinity. The difference is several mgal and is shown in the upper part of Figure 17 (model M1).
This positive differential may be due either to an excess of denser Precambrian rocks, i.e., an extension too far east, or an hitherto unsuspected low density body. But where and what could this be?
If we accept that the Pinnacles mass is different - and it is magnetically - could it not also be different from other Cambrian units in density? No actual values are available but the implied

description and the association with porphyries does suggest that its bulk density could be as low as 2.62 gm/cc. A slightly higher bulk density is employed in model 2 (lower part of Figure 17) to show that this and a substantial volume at the junction in the basement can satisfy all the requirements of the gravity profile.

The magnetic profile for line 3875 poses some quite different tests and provides some independent checks. The distinctive character of the magnetic field west of the Rosebery Fault is marked, as is the spiky character over the Central Volcanics. The smooth zone between them is easily recognised. This profile is a residual form; the gross effects of the deep source have been removed and the profile only barely glances its effects in any event. Thus any imperfections in the regional separation as a result of high level continuation will not be critical. Every anomaly along the profile provides some constraint on what is possible.
The general wedge and separated source character of the volcanic wedges - there are at least three - is as noted previously (e.g., Figures 2, 3). But the analysis suggests an additional slice of comparable material at shallow depth beneath these major inferred detachments. This may take the form of an additional wedge, a sheet, or another detachment. Whichever is in fact the case this additional volume does not penetrate the main trough fill which remains identifiable and distinctive. A maximum susceptibility is indicated which may be influenced by the imperfectly compensated deeply magnetic unit responsible for the major anomaly of the region.
What is clear, however, is that the style of the solution will satisfy both data sets without much difficulty with properties which are either sustainable from known measurements or from direct inferences from anomalies and sources which outcrop (the MRV requirement).
An excellent curve fit can be obtained if some allowance is made for the local mafic content within the Oonah Formation. In this situation the volumes implied both gravimetrically and magnetically are consistent.

The porphyry-rhyolite volume inferred in gravity analysis is quite crucial to the magnetic interpretation. First it modifies the effect of the Oonah basement and second it has properties distinct from what may be termed normal volcanics or the upper volcaniclastic Cambrian rocks. There is no question about placing dense or more magnetic units in the region of the Pinnacles Ridge. They are not there. Something very different is. And that material is unlikely to be any associate of the Central Volcanics. Elements of this core margin intrusives or extrusives may well be partially exposed and represented by some of the porphyries to the NE - all of which are virtually non magnetic unless very locally altered.

This solution (Figure 18 lower) also allows a role for the Rosebery Fault in displacing the material with an offset of perhaps 1200 m. This motion to the west could well have produced some of the local folding which now forms the ridge by typical detachment reaction.

The implications are clear. Poltock's solution is viable, but only

at the Pinnacles itself or within the lower parts of the defined rift sequence. And the units involved are NOT Central Volcanics or any correlate. They may be much older depending on the actual relationships ultimately divined on the southern margin of the rift.
But there can also be no doubt that the two marginal structures which define the rift are likely to be very important in an exploration and mineralisation context, especially since it is already known that the southern or eastern face was mineralised with the production and preservation of several substantial ore bodies.

Now it may be argued that Central Volcanics could still be involved as correlates in these positions on the basis of magnetics alone due to the effects of burial. This paradox is illustrated in Figure 19. Each of the profile represents increasing depth of burial and it is clear that if the volcanics were buried by 500 to 1000 m that their effect would not be recognised in terms of spikiness. But the total smoothed response would have to be compensated. It is this element coupled with the direct evidence that the Burns-Pinnacles materials are not magnetised like the normal volcanics which shows that simple burial is not a solution. And some of the material is directly exposed.
Thus, even without the indications of the gravity data, this option is simply not sustainable.

ISSUE 2: ORIGIN OF THE MAJOR RIFT ANOMALY

Previous work has canvassed many of the options in a partial analysis and found that it was most unlikely that any combination of low contrast or shallow sources could explain the gross effect. Thin slices of deeply buried ultramafics were offered as an explanation (see Figures 2, 3, 9, 10).

A SW-NE profile was selected along the axis of the quiet magnetic zone which fully defines the entire anomaly in so far as extant data permits. This profile, known as M7684, extends from 376 000 mE, 5384 000 mN through the anomaly crest at 382 000, 5390 000 to the Murchison Highway near Que River.
Figures 20, 21, 22 illustrate some of the possibilities which offer solutions or which have been proposed as solutions.

Figure 20 suggests what may be termed the shallow options. The upper model uses extreme values for the porphyry and its virtual exposure to show that neither the distribution or contrast of this lithology will ever account for the anomaly. There will also always be a problem at the edges of the body due to the low contrast and hence a conflict with the established changes in the surface geology which occur along this profile. As concluded in earlier work this is not a viable solution. At best, the altered portions of this unit may contribute to some local, high frequency parts of the magnetic field.

The lower part of Figure 20 considers the implications of increasing the magnetisation by an order of magnitude to that of glassy basalts such as present near Mt Charter. When this is done a solution is actually possible but is 7000 m of such basalt credible in the region of the Pinnacles Ridge? An interesting but incredible solution which could only be accepted in the absence of other data, either geological or geophysical. Note that this solution is not sustainable gravimetrically. Seven kilometres of basalt would generate an anomaly across or along the rift of 30 mgal minimum!

Figure 21 considers two alternative mafic solutions. The upper solution based on the same contrast as the previous model has placed the mafic pile at considerable depth. Without a major contrast in thickness, however, this cannot generate the anomaly relief and is not a viable solution.
If, however, the contrast is trebled to that of a moderate to strongly magnetised basalt column of variable form then a good fit is possible.
The latter solution might even be of some interest in the absence of the gravity data which cannot allow it.

Ultramafics have previously been proposed as a solution even though the alternatives have never been tested gravimetrically. Two ultramafic options are shown in Figure 22. These clearly show that with any normal properties representative of these materials and with no thickness greater than those known to occur in typical exposures, as for example at Razorback or Serpentine Hill, there is no difficulty accounting for the spread or amplitude of the observed anomaly. The models indicate that the distribution of the mafic sources must be irregular and are not likely to be completely detached or isolated. Note that isolated sources are not easily arranged to generate a smooth response like that observed whereas a folded sheet can achieve this effect. The latter solution is wholly consistent with what is known of the ultramafics of western Tasmania; namely that they probably once occurred as a finite but small number of sheets covering wide areas during the Lower Cambrian and that this horizon now forms an effective marker which has been disrupted during the Cambrian extensions and folded subsequently.

It should also be noted that the depths inferred in the Pinnacles region are consistent with both the regional and local models shown in Figures 16, 17 and 18 for the likely base of the rift sequence. Of greater interest is the increasing depth indicated to the NE with a possible maximum in the Mt Charter area. This could also imply that the entire rift axis and sequence is much thicker in this part of the region and that association may be an important key to the localisation of mineralisation. The absence of data beyond the Murchison Highway limits evalutation of the possibilities NE of Mt Charter or Sock Creek.

But a definitive answer is also possible for the second issue. A folded sheet of ultramafics, beneath the rift column, is responsible for the observed regional anomaly.
It is likely that uplift and erosion has removed much of this material from the lateral sections and thus the anomaly reflects preservation and history. This also implies some relative ages for the materials both within and beyond the rift and suggests that the rift sequence is older than the main body of volcanics and was

deposited while the lateral cover was being eroded. All this must have happened prior to felsic volcanism along the margins and only the upper members interfinger and correlate. Even these linkages have now been confused by detachment above basement while the main rift column has been largely unaffected.

I infer that the main rift column is exposed in the zone adjacent to the Pinnacles and NE of Sock Creek.

ISSUE 3: RELATIONSHIP OF THE HOLLWAY SEQUENCE TO THE CENTRAL VOLCANICS

Previous interpretations have presented some conflicting concepts. While the overall shape of the volcanic wedge is suggested to thicken with shallow dips to the SE, a view supported by the present interpretation, many members of the wedge package appear to dip steeply *NW*. There is, therefore, *the possibility of suggesting* that the Central Volcanics may overlie the Hollway sequence (including the andesite) *provided* the detachment reaches surface at the contact between andesite and other volcanics. It would not then matter what conflicts in dip existed within the volcanic pile. If, however, the andesites *are part* of the volcanic complex then these could form the tip of the detachment wedge with the main complex stratigraphically beneath them.

Some limited testing of these options has been possible for this report but the time available has limited analysis.
Figure 23 provides an example of the problems and issues. The observed magnetic data, corrected to 120 m clearance, has been used. This profile shows some asymmetry due to crossing the rift edge and sampling the deep effects of the preserved ultramafics on the western side. This regional component has been ignored in the calculations.
Modelling of two systematic variations which can, with very minor adjustment, satisfy the western and central gradients. These can both be viewed to infer east dipping detachment beneath the magnetic volcanic member which in the upper case dips east and in the lower case dips west. In each case the andesite and its properties have been ignored. Inspection of the data set generally indicates that it is either not magnetic or very much less magnetic than the volcanic member to the SE. In the upper case the fit depends on an unrealistic location of the NW face of the volcanics (based on extant mapping) while the lower solution is consistent with the rock distribution.

Insufficient work has been done to completely resolve this issue or to properly locate the detachment but it may lie at the top of the host sequence and the base of the andesite on the NW side of Burns Peak. Any further analysis must consider the implications of the underlying section and the relatively negative effect to the SE.

CONCLUSIONS

Although limited time and analysis has been possible several important conclusions can either be made or inferred.

1. The Burns - Pinnacles Ridge trends N-S across a major structure which trends NE-SW.

2. The Ridge is sub parallel to a primary change in basement composition and depth and lies just east of the controlling structure.

3. The major NE-trending structure is a deep rift with mainly (inferred) sedimentary rocks to a depth of about 3 km below present surface. Other indicators would suggest that the rift package is about 2.5 km thick.

4. The base of the rift fill is marked by a strongly magnetised unit whose properties are consistent with ultramafics. This material is relatively thin (<300-500m) but essentially continous and apparently folded.

5. Similar highly magnetised materials are present outside the rift but at much shallow depth and are much more disrupted. This is consistent with disruption of a once relatively universal marker by marginal uplift and erosion, and later half graben extensions.

6. The continuous layer of ultramafics deep in the rift account for the strong regional anomaly and its position with what is otherwise a very quiet magnetic zone. Various other possibilities, including contributions from quartz porphyries and various distributions of mafic rocks may be excluded.

7. The SE margin of the rift is now partially concealed by displaced Central Volcanics of the Mt Read Volcanics but the ghosts of the structure are marked by the offsets and bends of the Mt Charter Fault near Mt Charter and the Jack Fault near Que River and Hellyer. The Burns Peak mineralisation lies just inboard of the same structure which clearly has great potential.

8. The volcanics of the Mt Block and Boco region are different in properties and responses - and structural style - from those within the rift and north of its southern margin at Burns Peak. The rhyolites and other materials of the Burns - Pinnacles Ridge are thus inferred to be an older suite and possibly not related to the Mt Read Volcanics.

9. A large mass of acid material, possibly quartz porphyry underlies the ridge in the rift margin near the intersection with the ancient basement boundary. This appears to have been offset by the Rosebery Fault system and it is possible that some of the folding observed near the Pinnacles Ridge is related to this dislocation.

10. Packages of volcaniclastic rocks exposed NE of Burns Peak and the volcanics to the east appear to be dislocated slices from larger wedge-shaped piles and deposits. There are at least three detachments which affect the volcanics piles significantly and a fourth may be inferred within the upper part of the rift sequence. The latter structure may mark the onset of MRV volcanism and not represent a detachment. All piles and detachments face east although some internal members of the piles may dip steeply west. The detachments may be recognised from these relationships.

11. Any stratigraphic host relationships inferred in the region north of Burns Peak must be treated as local features on the basis of this work. It is unlikely that they will be traced or effective beyond the rift zone. But the relationship may apply as far north as Silver Falls and as far south as 377 000 mE, 5382 000 mN near the Rosebery Fault. This includes all the known mineralisation N and W of Burns Peak.

11. The main southern rift boundary is occupied by the position of the Hollway andesite near Burns Peak. The contact is obscured by the overlapped volcanics.

12. Insufficient analysis has been completed to determine whether the detachment which introduces the volcanics near the Hollway Sequence lies at the eastern or western boundary of the andesite. The most likely situation is that the volcanics - including the andesite - are on the detached slab and that its base is the western limit of the andesite. This structure would then overlie most of the host sequence and the rocks of the Pinnacles Ridge. Units within this detached wedge appear to dip steeply west.

13. There is scope for more analysis of the structures along the southern face of the rift defined since this zone has been clearly mineralised at key fracture intersections. Sub E-W and N-S elements are certainly involved.

14. A more comprehensive view of the Hollway Andesite is also required since the two suites of volcanics with their very different properties extend southward to Rosebery. The andesite offers a means of attack.

15. The northern face of the rift has received little attention, either by this study or any previous exploration, and its significance is unknown. Burial, by various younger materials, to the NE largely accounts for this ignorance but it may prove to be of exploration significance.

16. Further regional assessment is recommended after all newly acquired magnetic data has been assembled and combined with existing data. The gravity data base should also be compensated for the effects of regional granitoids prior to comparison with the magnetic data and further analysis. There is scope for considerable structural refinement.

Figure 24 summarises various elements of this interpretation upgrade to suggest the refined location of some of the structural elements and their possible associations. This view remains incomplete and inevitably tentative but the features identified by the potential fields must be understood and integrated if exploration of deep or concealed targets is to prove successful.

RECOMMENDATIONS

Four particular recommendations are offered.

1. Further evaluation of the Hollway zone must be undertaken. The present, and all previous, work has neither been extensive nor complete enough to resolve all the important structural and stratigraphic relationships which offer appropriate physical contrasts in this region.

2. Further regional analysis is advised in order to place improved perspective on all licences. It is clear from the few long lines now modelled that doing so improves the resolution and assessment of quite detailed matters.

3. Before any extensive evaluations are undertaken the existing and new acquired aeromagnetic data should be compiled into a single data set at an acceptable clearance.

4. The gravity data set should be used in two forms. Either as a mantle-separated residual as here and never as raw Bouguer anomaly, or as mantle-separated residual with the best current model of the granites also used to refine this residual presentation. *Interpretation of such a map may then ignore the* effect of the granites and can be much more detailed as well as free of gradient torsions and offsets. It may be that these are sufficient to restore a view of the gravity field which is recognisably similar to the magnetic field.

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Leaman, D.E., & Richardson, R.G., 1989. The granites of West and North West Tasmania - a Geophysical Interpretation. <u>Geol. Surv. Tas. Bull.</u> 66.

012077

Report submitted on behalf of Leaman Geophysics

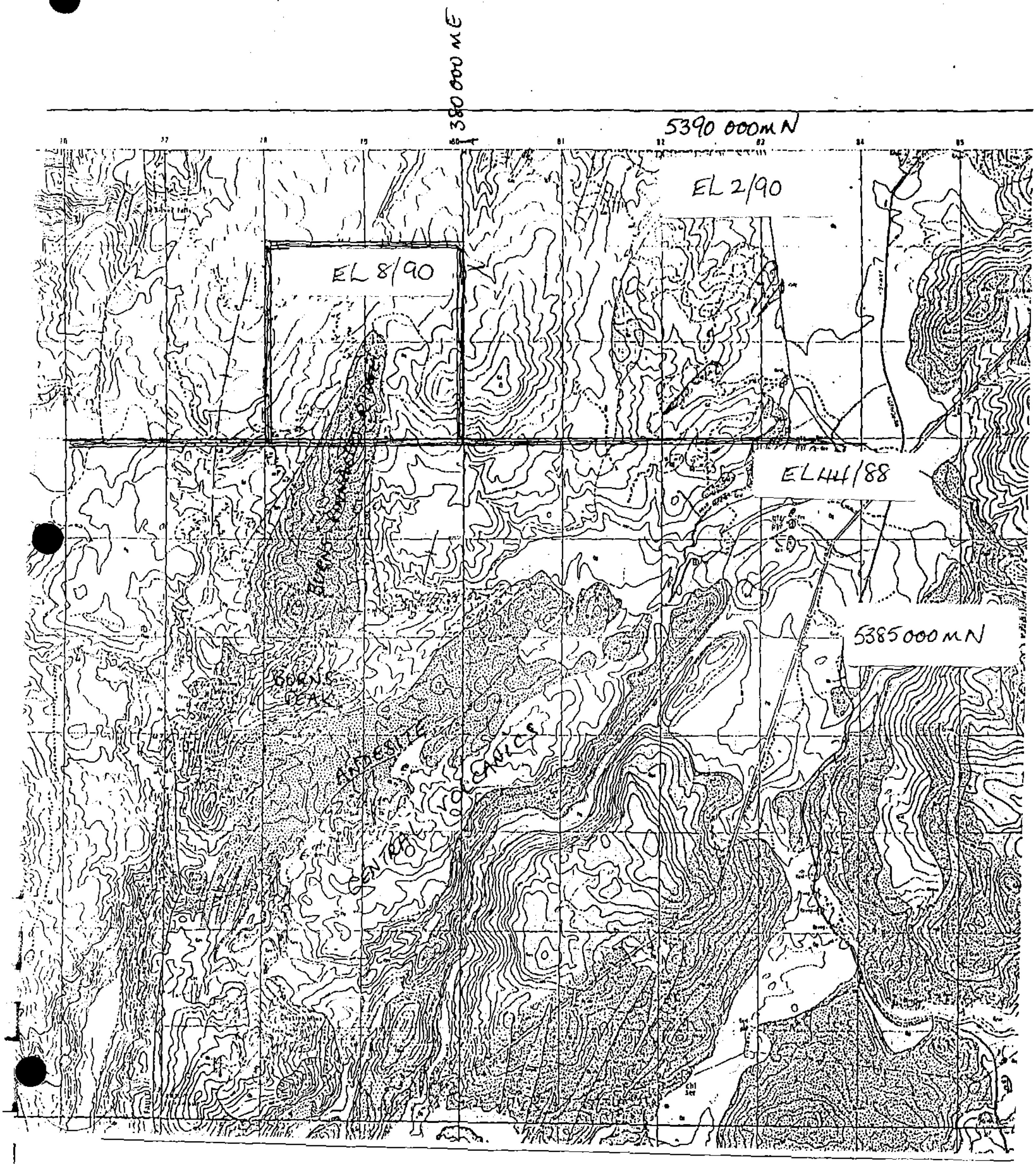
by

D Leaman

Dr. D. E. Leaman, B.Sc., Ph.D.,
F. Aus. I.M.M., M.M.I.C.A.

Date: 30/4/93

012078



REGIONAL GEOLOGY - MRV MAPPING (MT BLOCK SHEET)
SHOWING LICENCE AREAS

FIGURE 1

LEAMAN GEOPHYSICS
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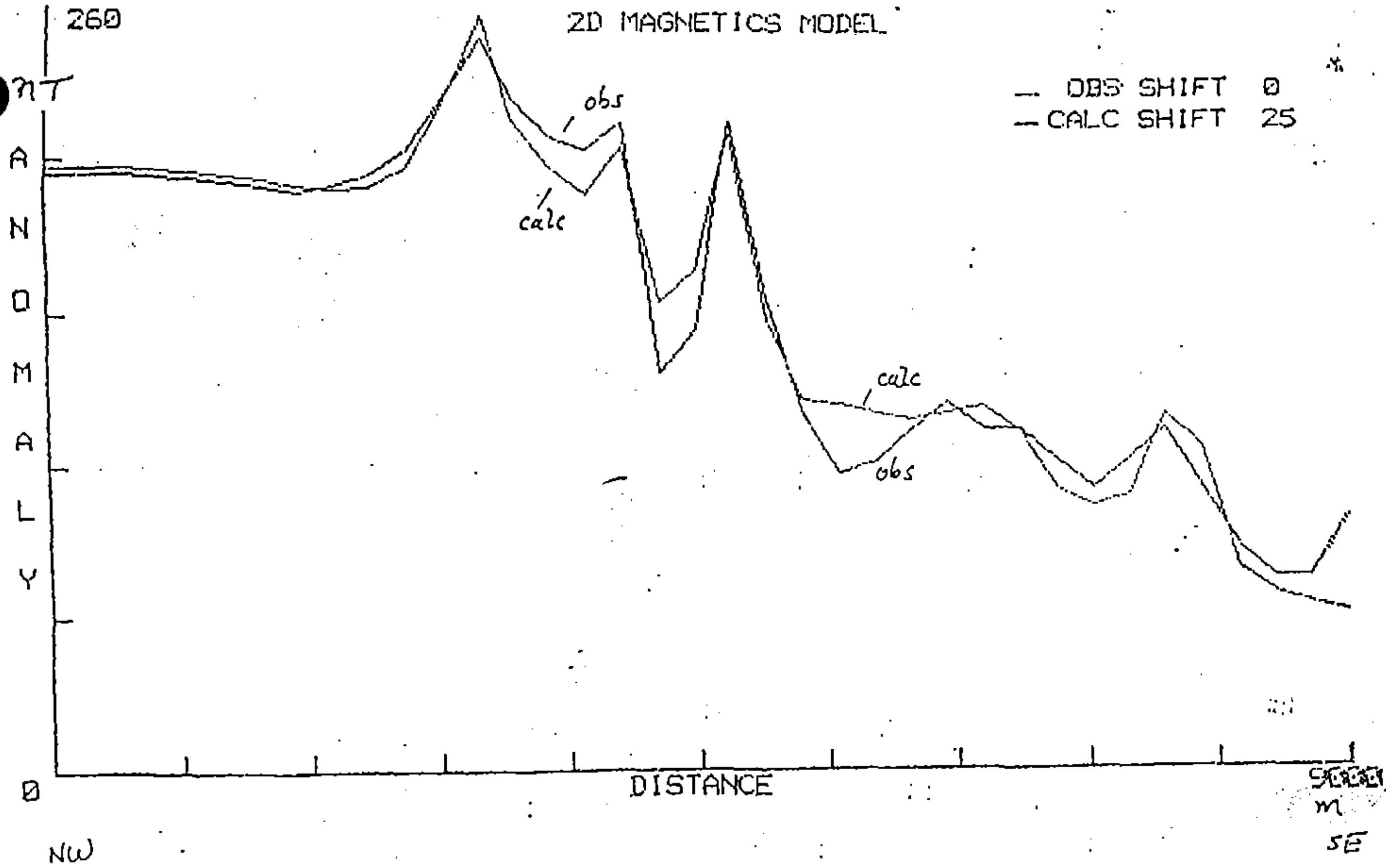
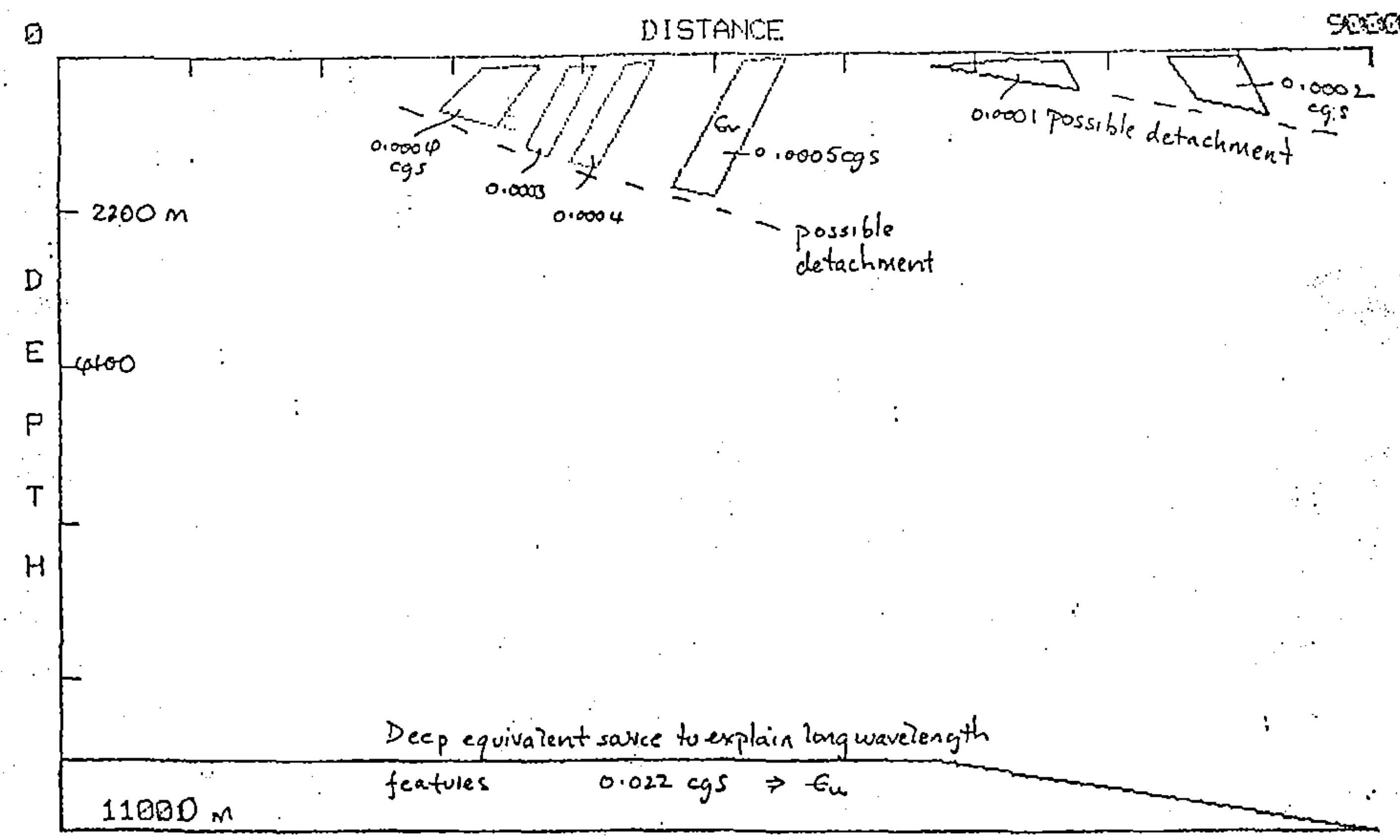
Hobart, Tasmania 7001



BURNS PEAK 44/88 M2 3795/5388-3865/5381 (2)



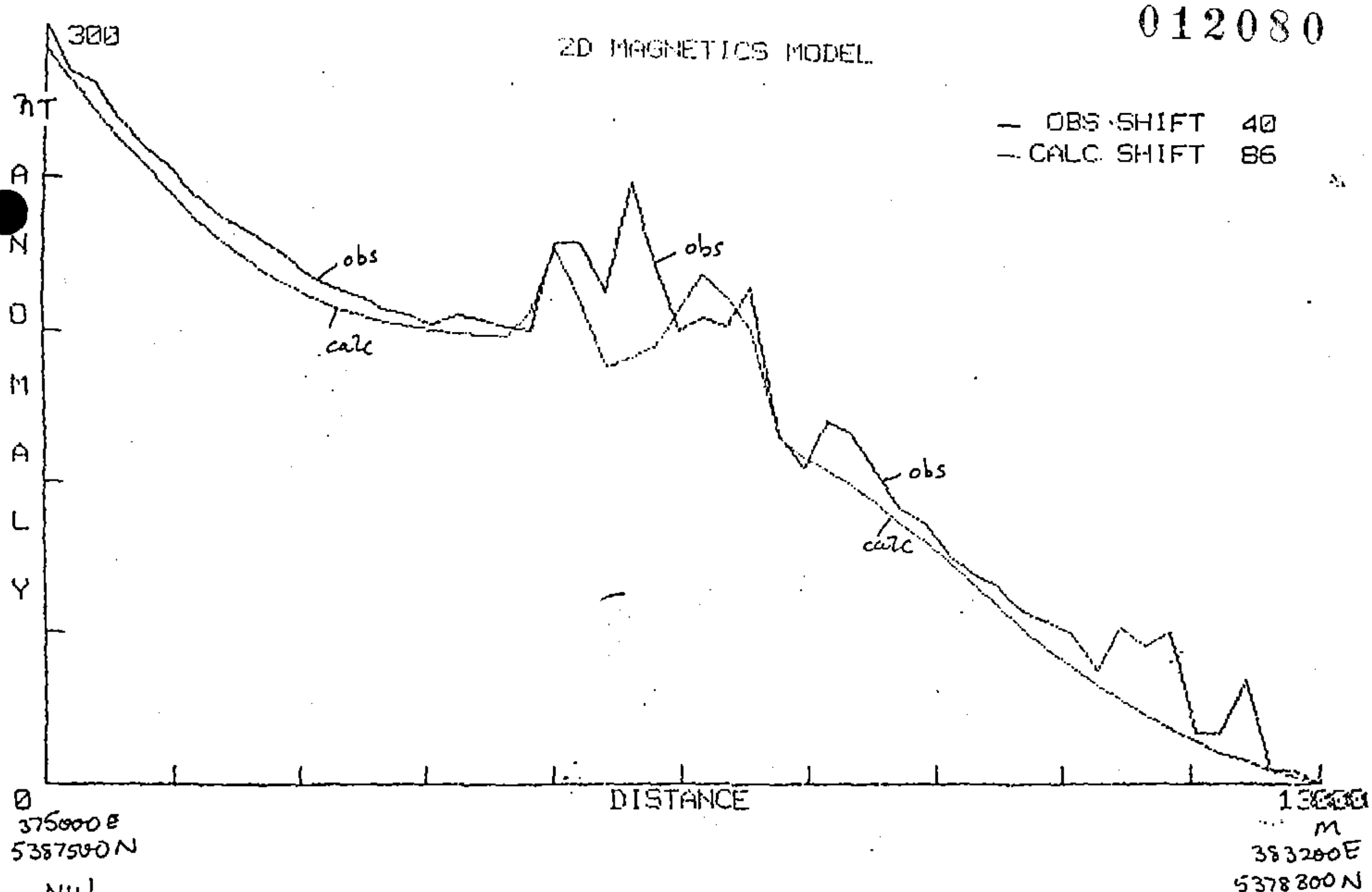
MAGNETIC MODEL PROFILE 2 EL 44/88

old (FIGURE 4)

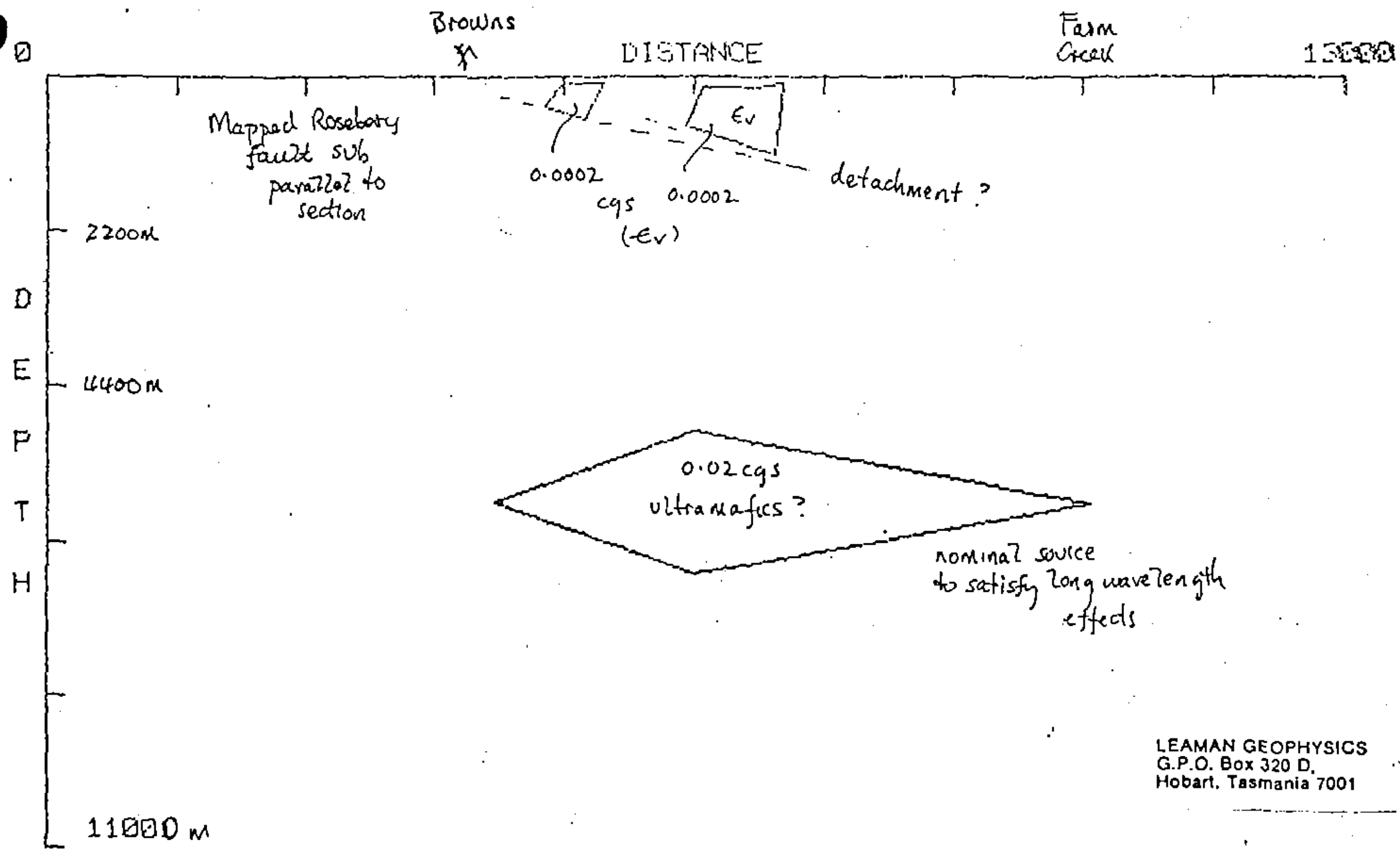
from Figure 8 (Leaman, 1990a)

new FIGURE 2

012080



BURNS PEAK 44/88 375/53875-3832/53783 (1)



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G.P.O. Box 320 D,
Hobart, Tasmania 7001

MAGNETIC MODEL PROFILE 1 EL 44/88

old (FIGURE 7)

new FIGURE 3

012081

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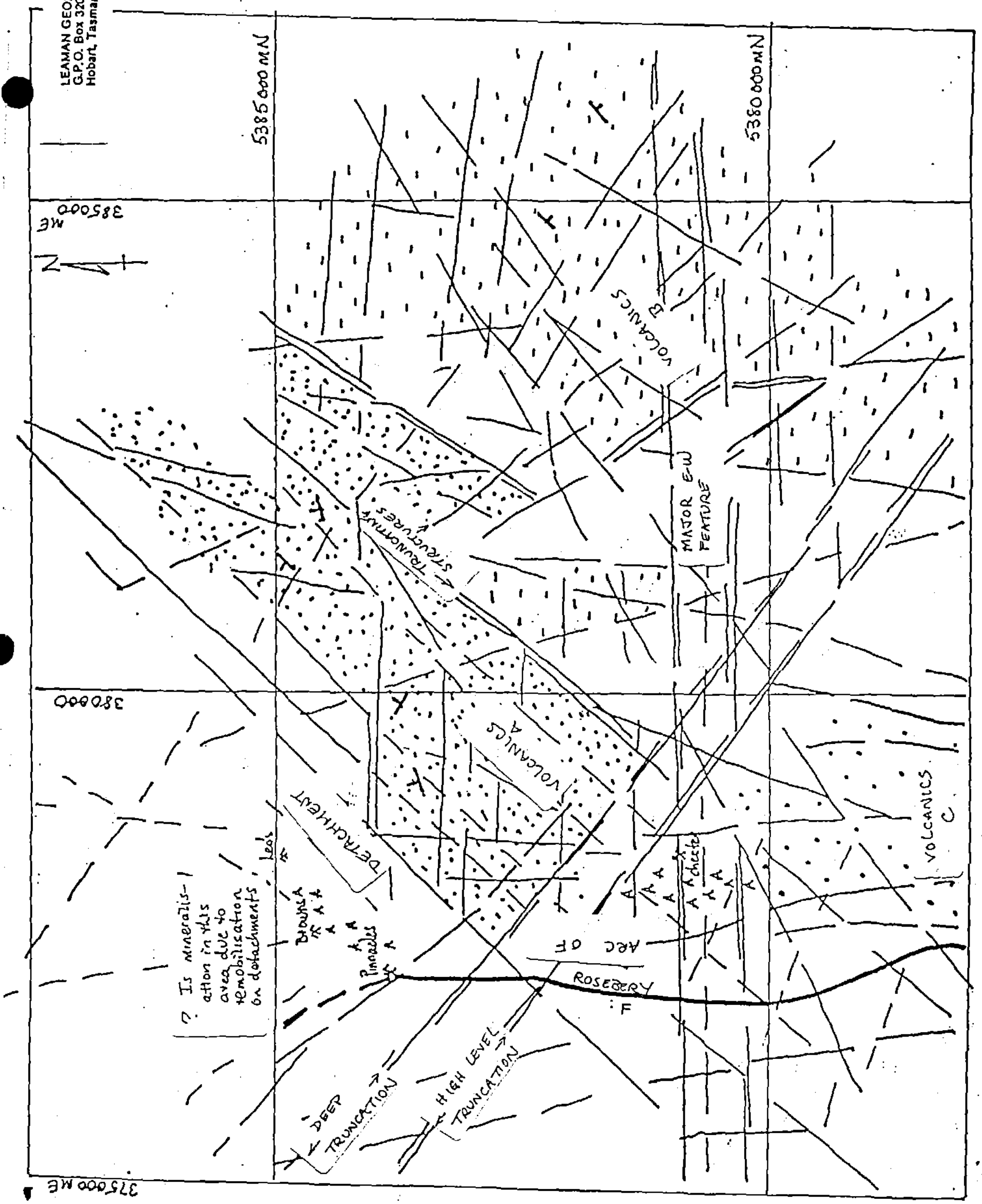

from Figure 13B (Leaman, 1990a)

SUMMARY OF TRENDS AND LINEAMENTS EL 44/88
LABELLED INTERPRETED FEATURES

(original FIGURE 15)
new FIGURE 4

012082

LEAMAN GEOPHYSICS
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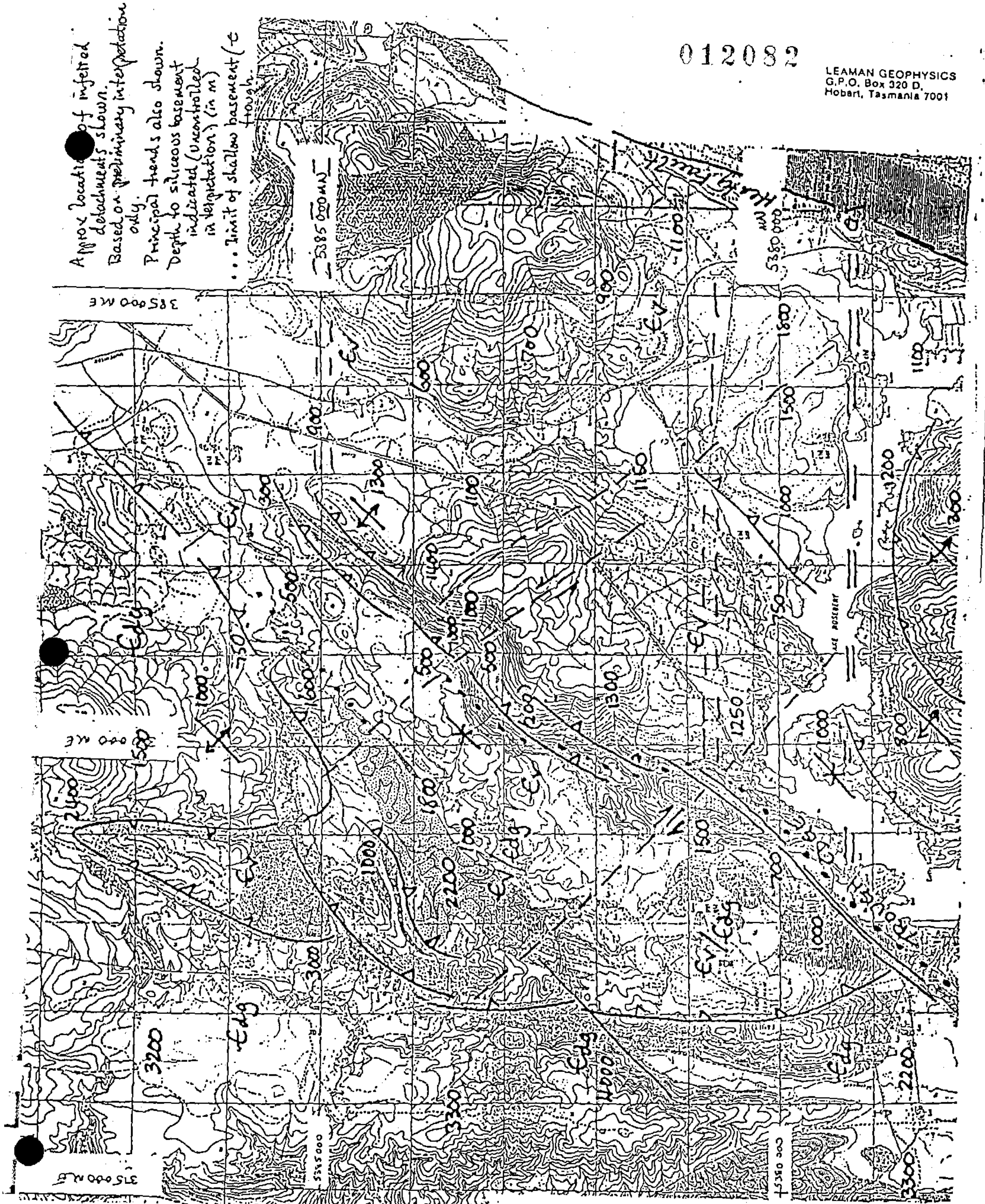
Hobart, Tasmania 7001



from Figure 15 (Leaman, 1990b)

new FIGURE 5

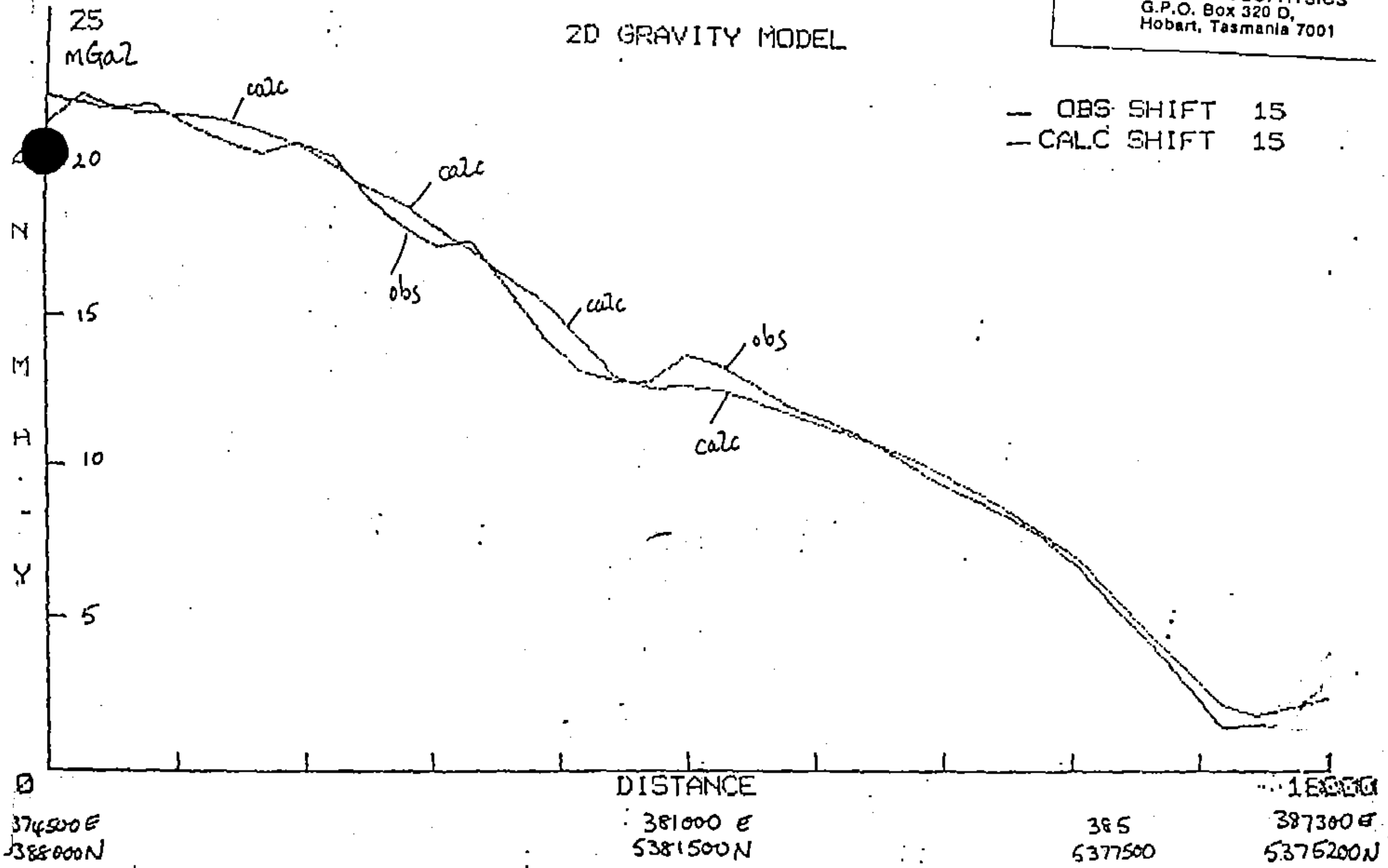
SUMMARY OF CURRENT INTERPRETATION EL 44/88 BURNS PEAK

original (FIGURE 8)

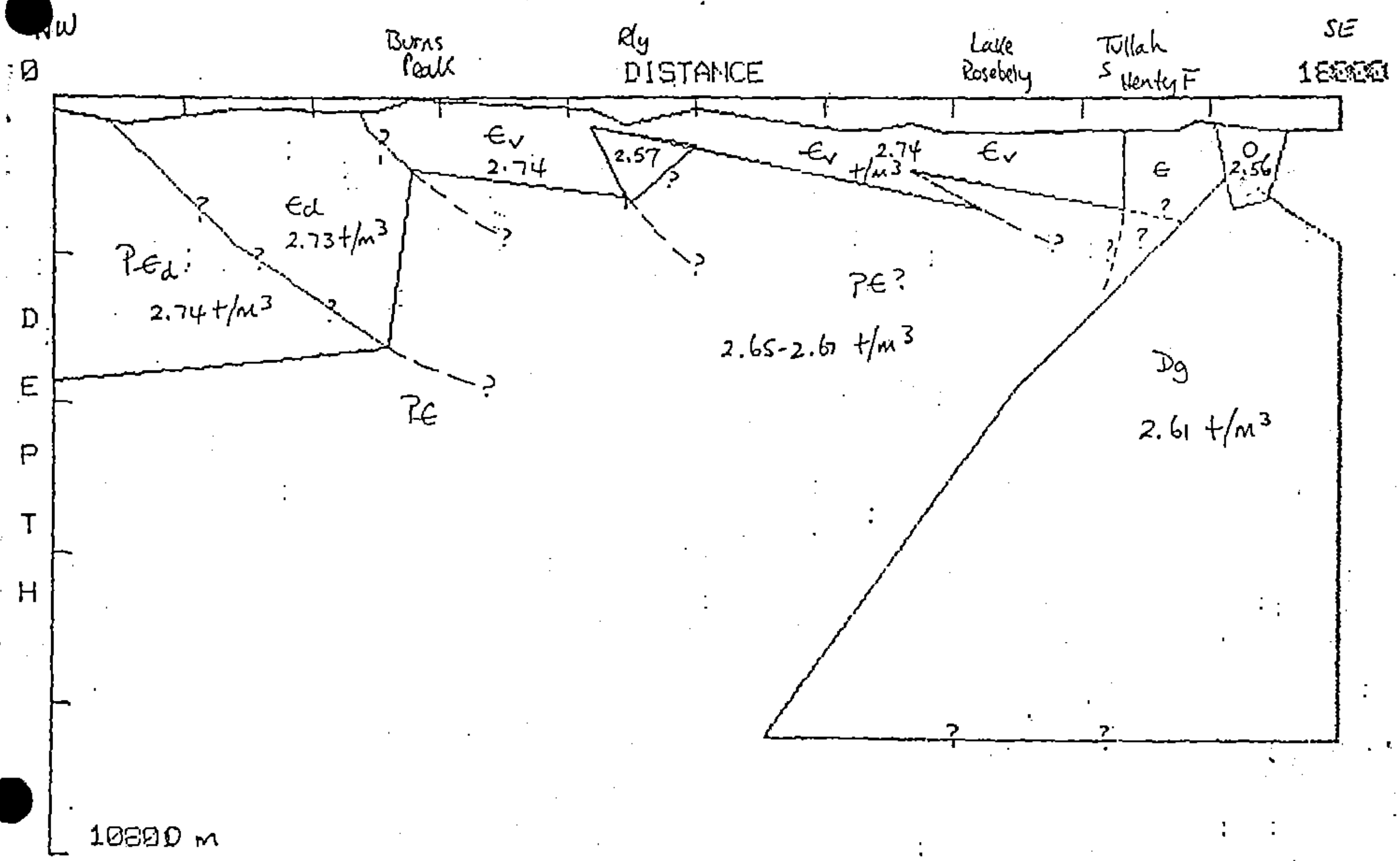
LINE PARAMETERS - ORIGIN,LIMIT,INCR : 0 10000 500

012083

LEAMAN GEOPHYSICS
G.P.O. Box 320 D,
Hobart, Tasmania 7001

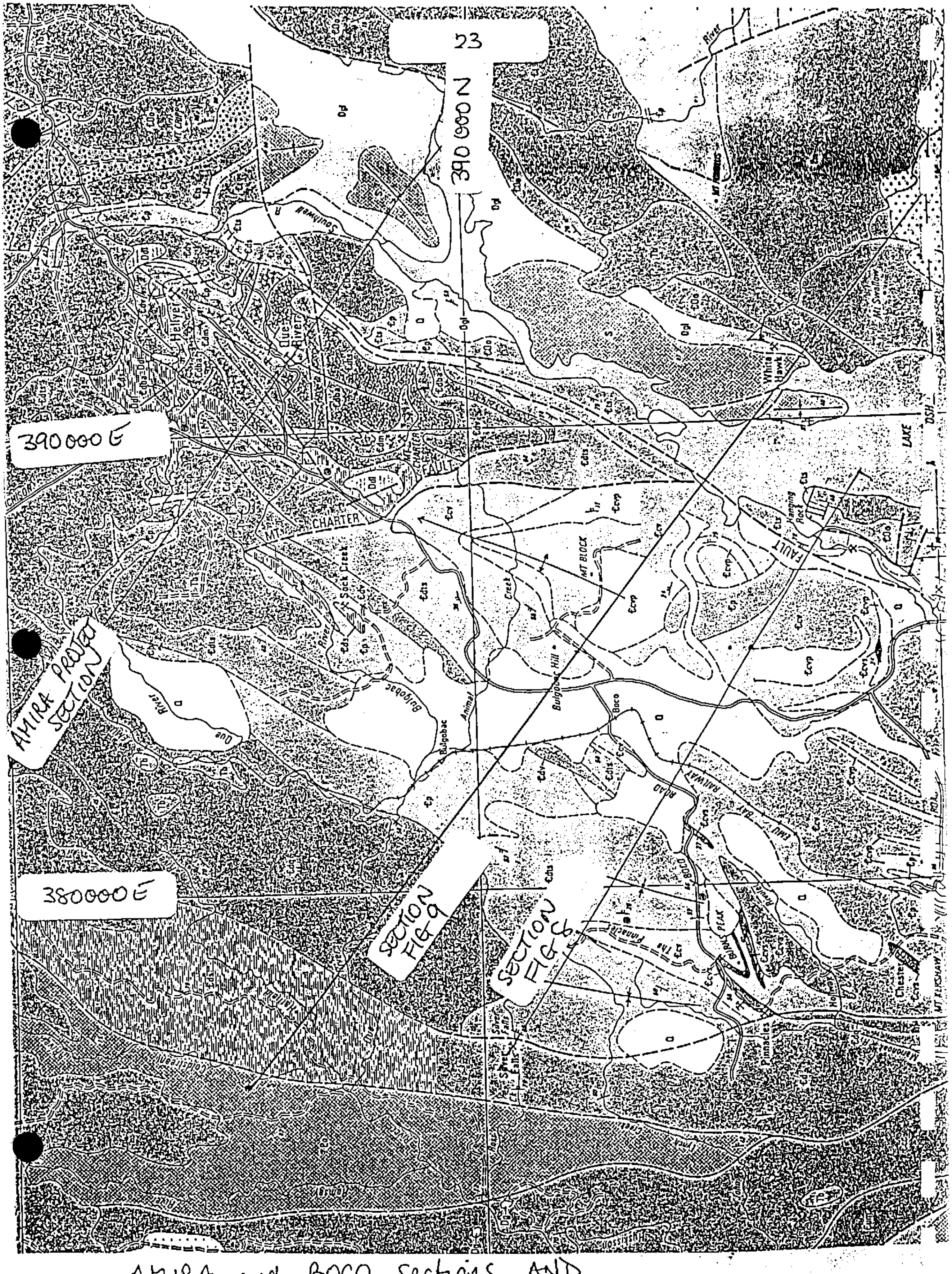


BURNS PEAK PROFILE 1 3745/388-3373/3752



from Figure 9 (Leaman, 1990b)

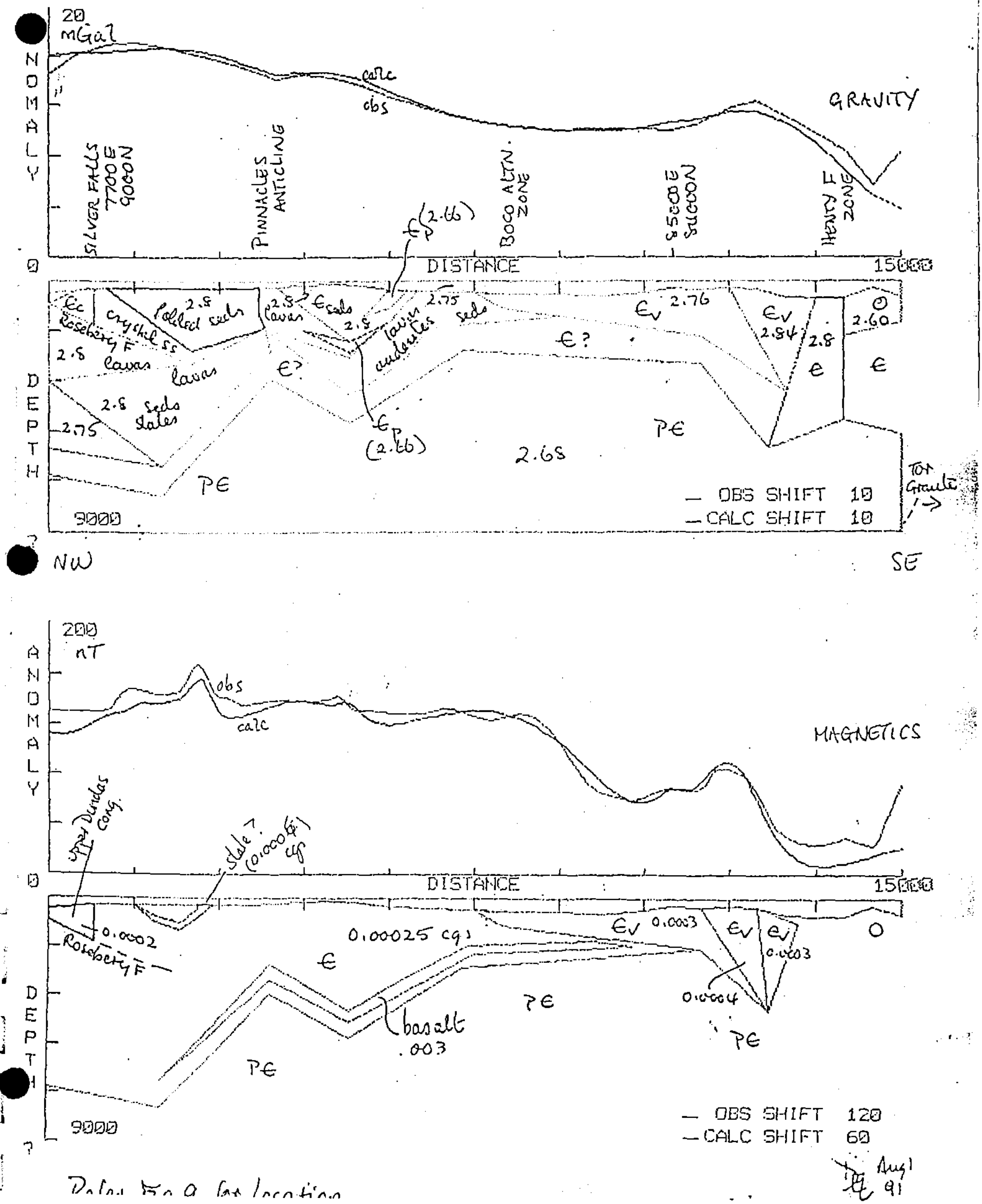
2D GRAVITY MODEL LINE 1 EL 44/88 BURNS PEAK (original FIGURE 7)
new FIGURE 6



AMIRA and BOCO Sections AND BULGOBAC SECTION.

FIGURE 7

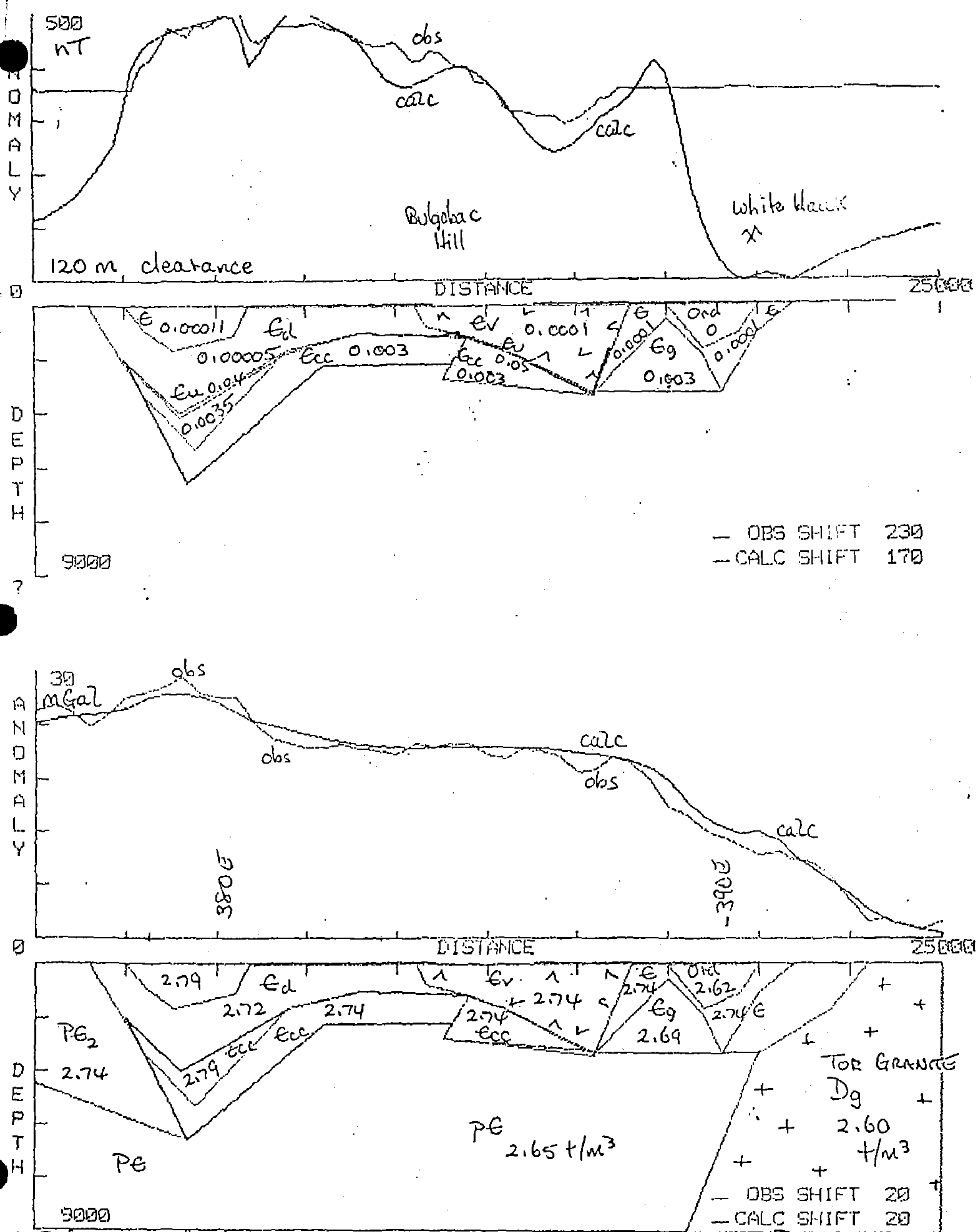
012085



REGIONAL SECTION 1. (See Figure 9 for location)

FIGURE 8

21



Refer Fig 9 (7) for location

LE oct 91

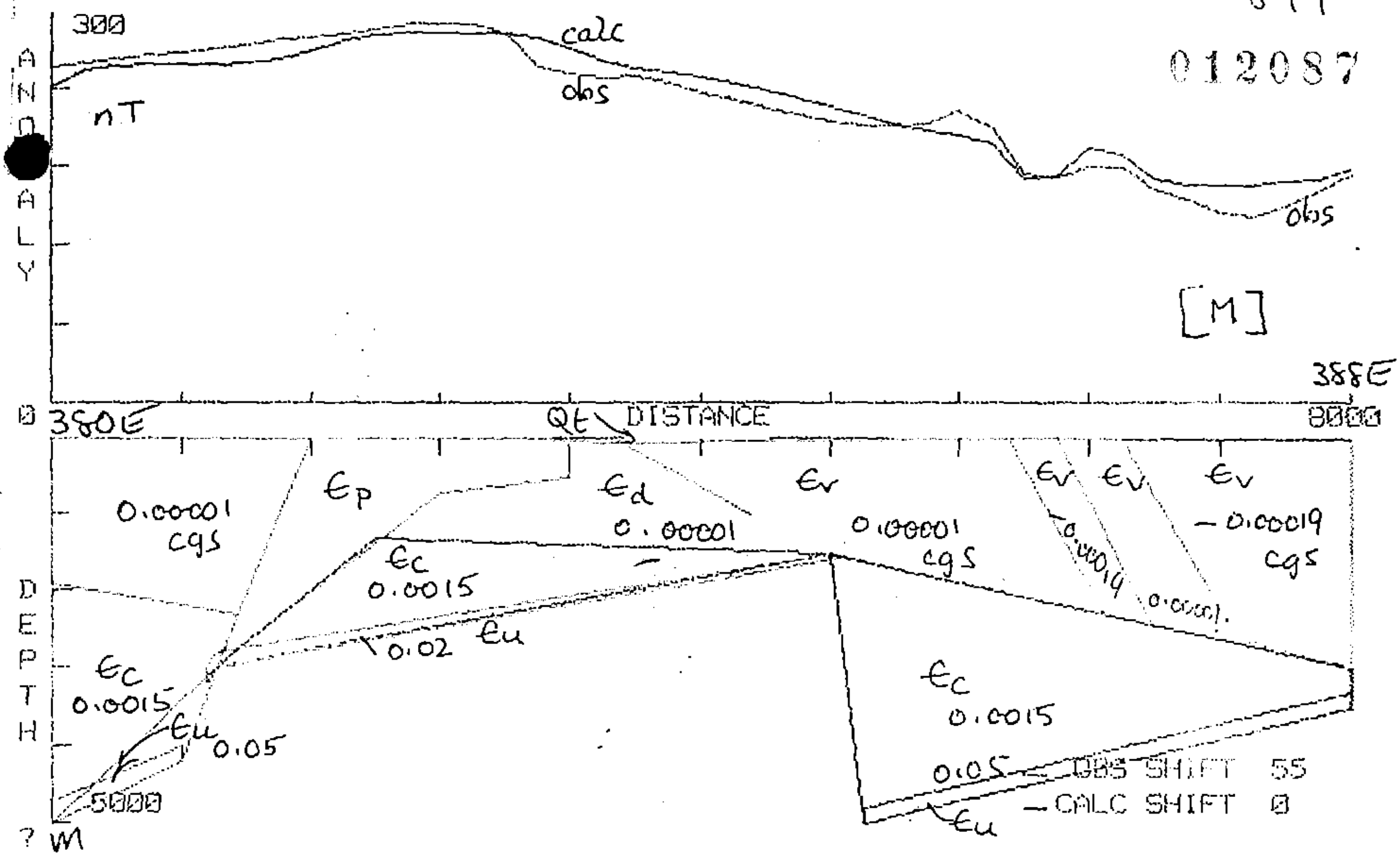
REGIONAL SECTION

(original FIGURE 10)

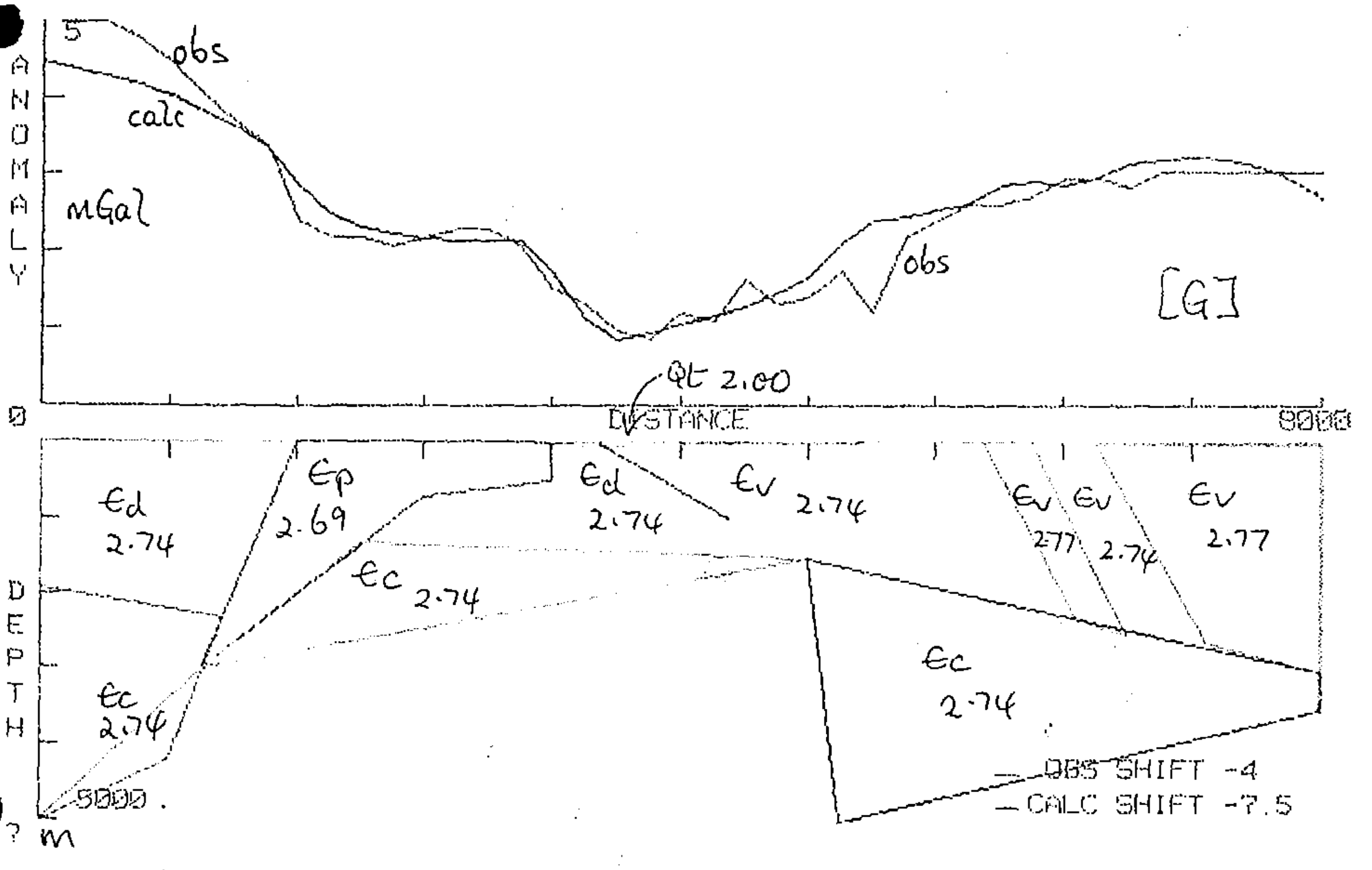
new FIGURE 9

891

012087



5389100N

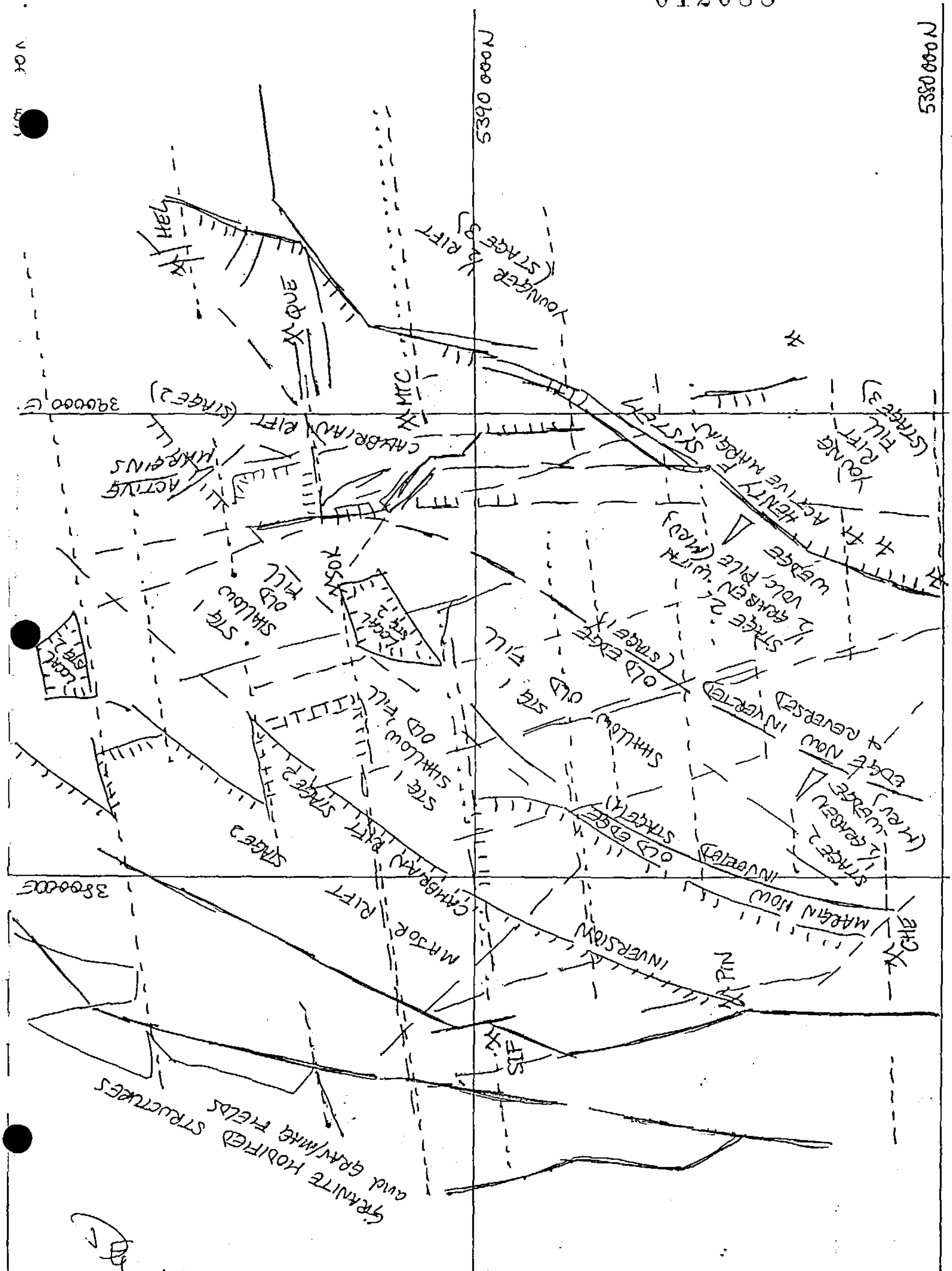


Boco 891M,G
891MD3
891M3,G3

GRAVITY AND MAGNETIC INTERPRETATION 5389100 MN OPTION 2 (original FIGURE 12)

DEL Dec 91

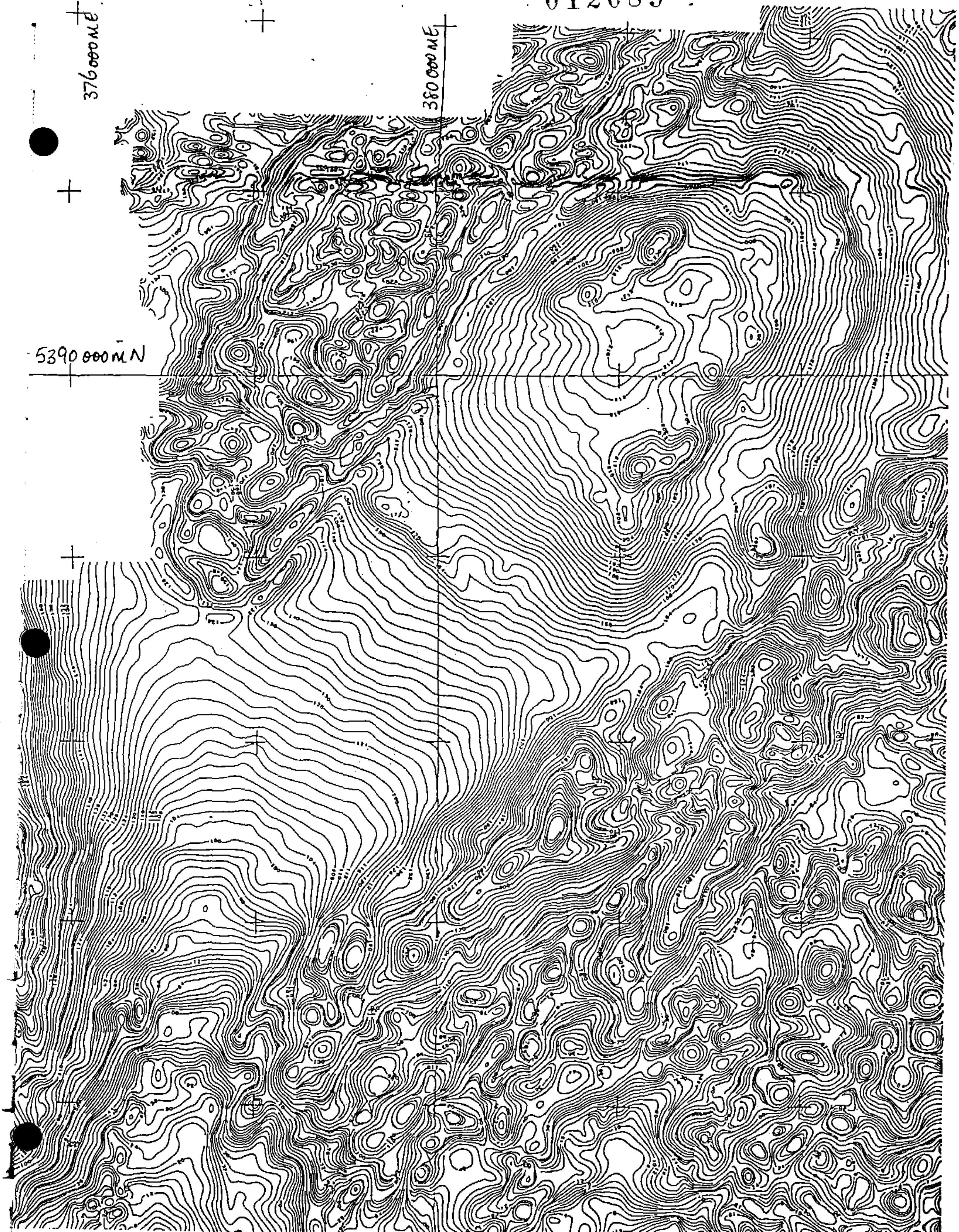
new FIGURE 10



STRUCTURAL SUMMARY

FIGURE 11

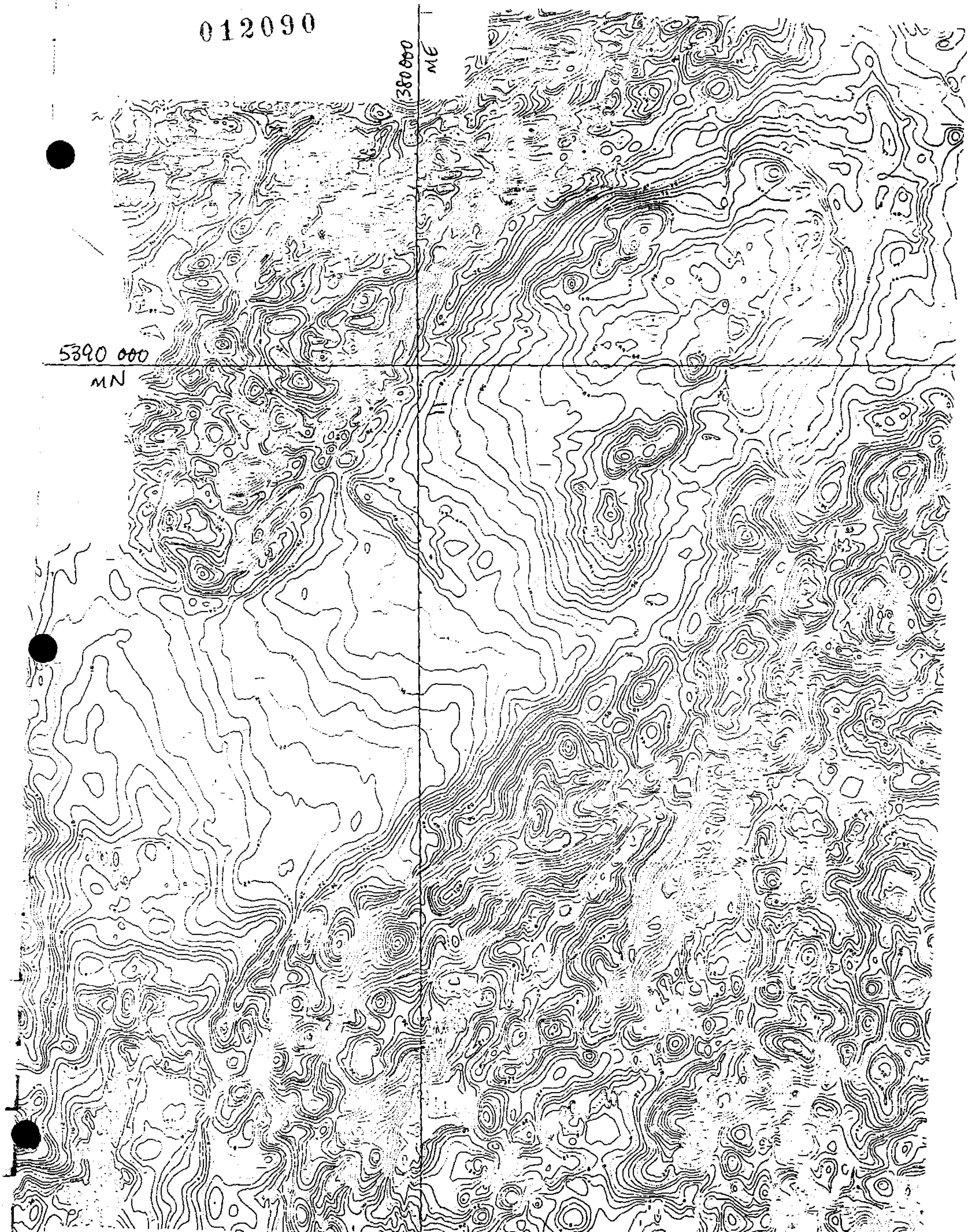
012089



OBSERVED MAGNETIC FIELD CORRECTED TO A 120 M TERRAIN CLEARANCE

FIGURE 12A

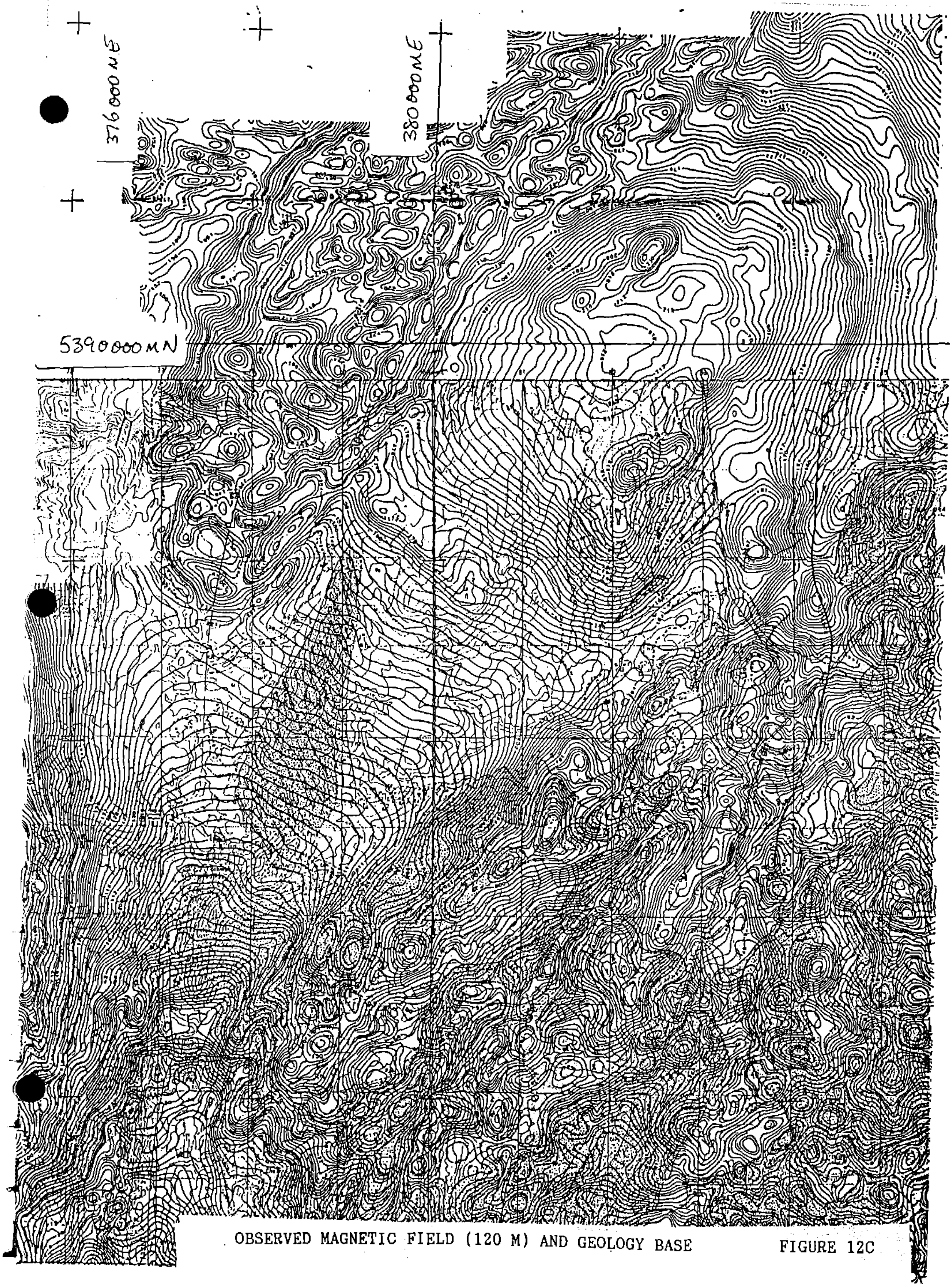
012090



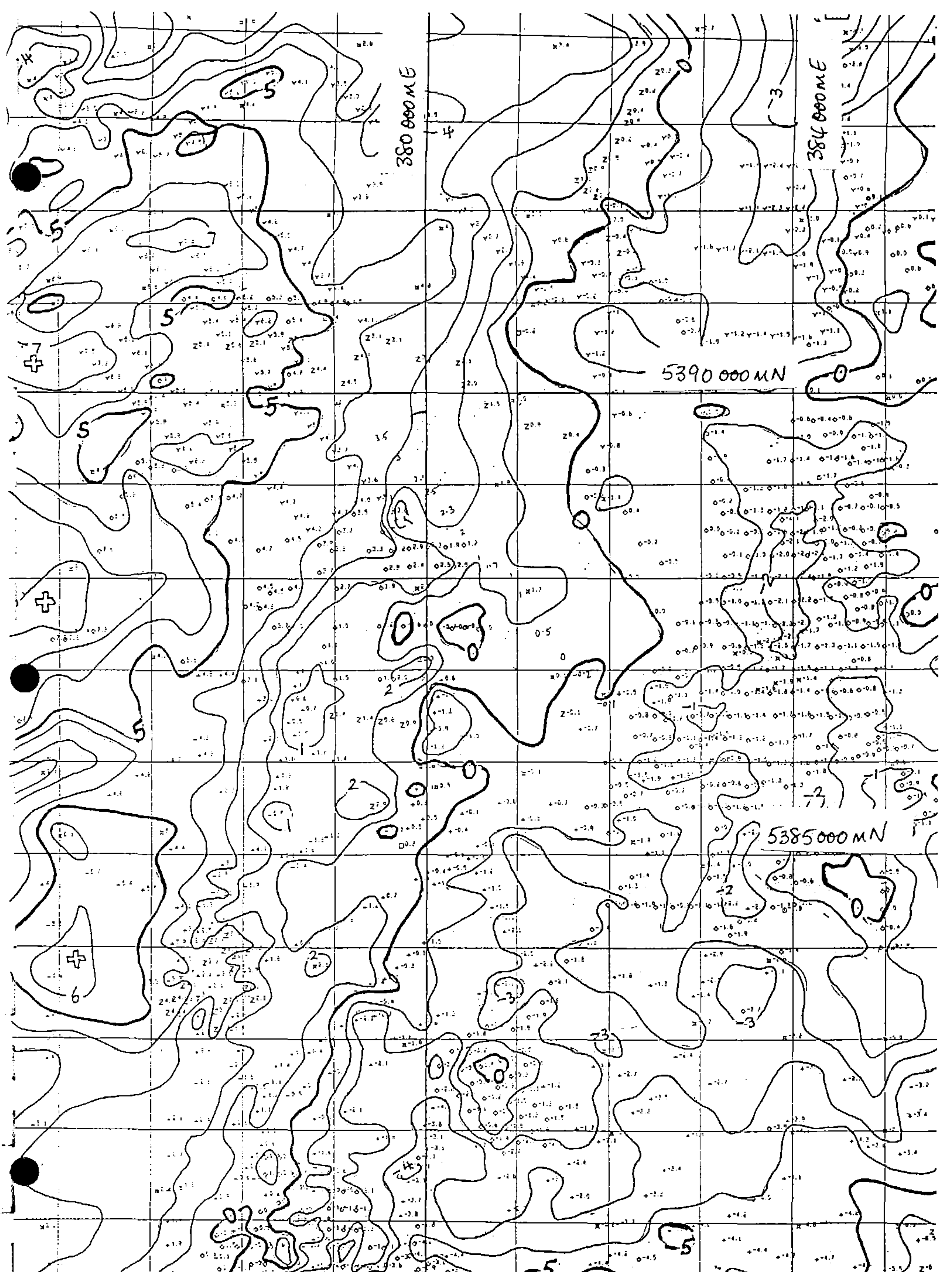
RESIDUAL MAGNETIC FIELD AFTER CORRECTION TO 120 TERRAIN CLEARANCE AND REMOVAL OF 1300 M LEVEL CONTINUATION

FIGURE 12B

012091

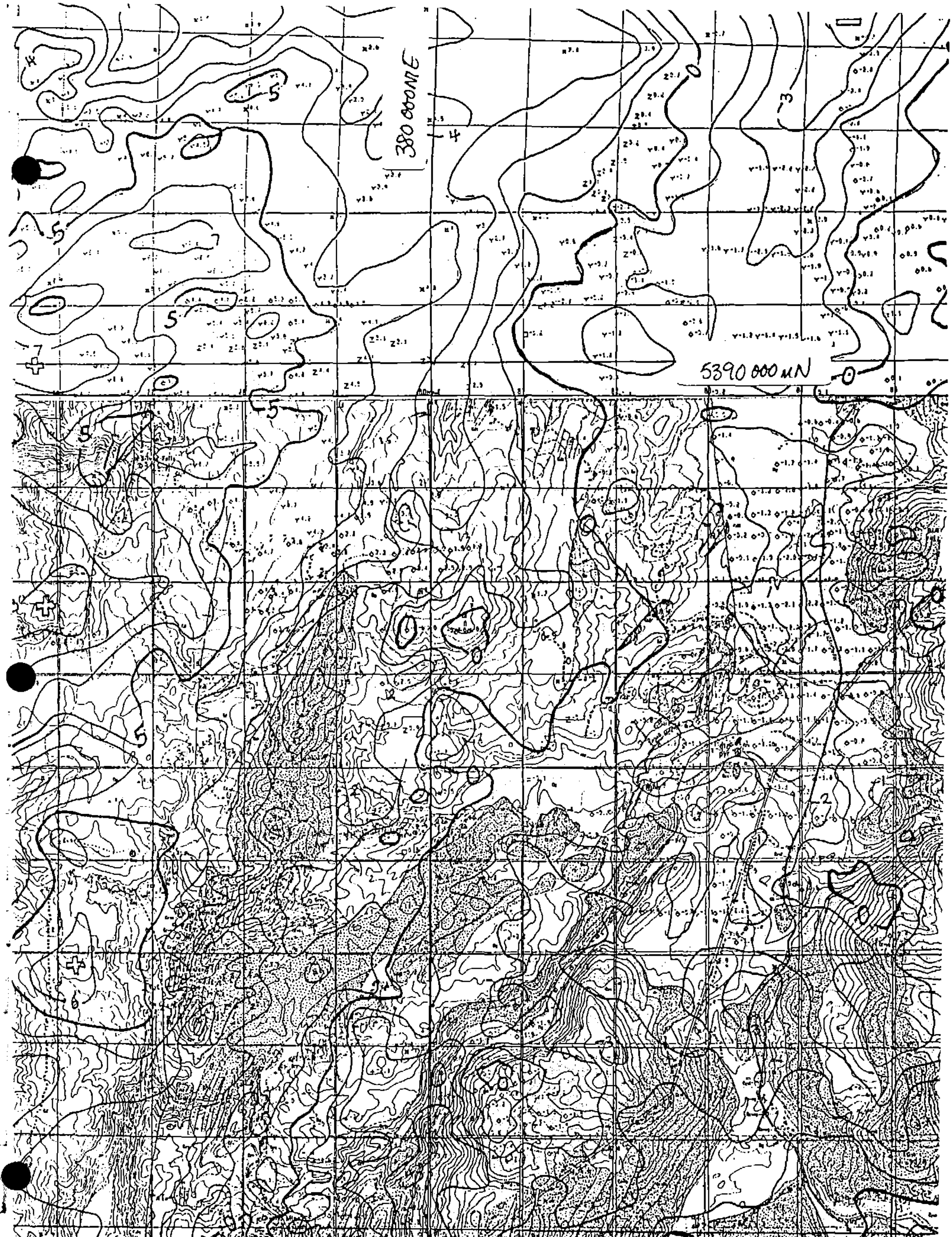


OBSERVED MAGNETIC FIELD (120 M) AND GEOLOGY BASE FIGURE 12C

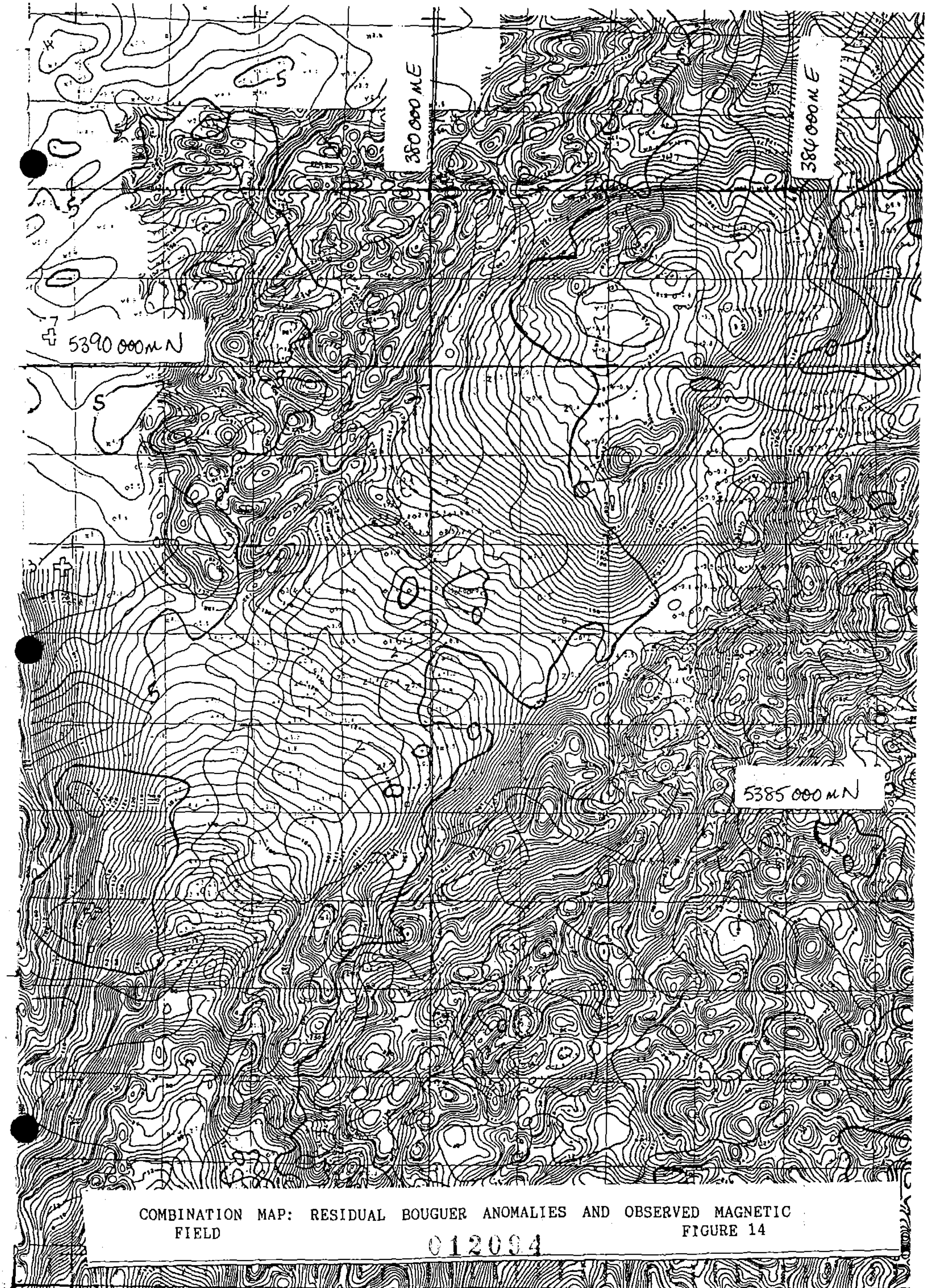


RESIDUAL BOUGUER ANOMALIES AFTER REMOVAL OF MANTLE MODEL (MANTLE91)
1 mgal contours, reduction density 2.67 FIGURE 13A

012092



RESIDUAL BOUGUER ANOMALIES AND GEOLOGY BASE 012093 FIGURE 13B

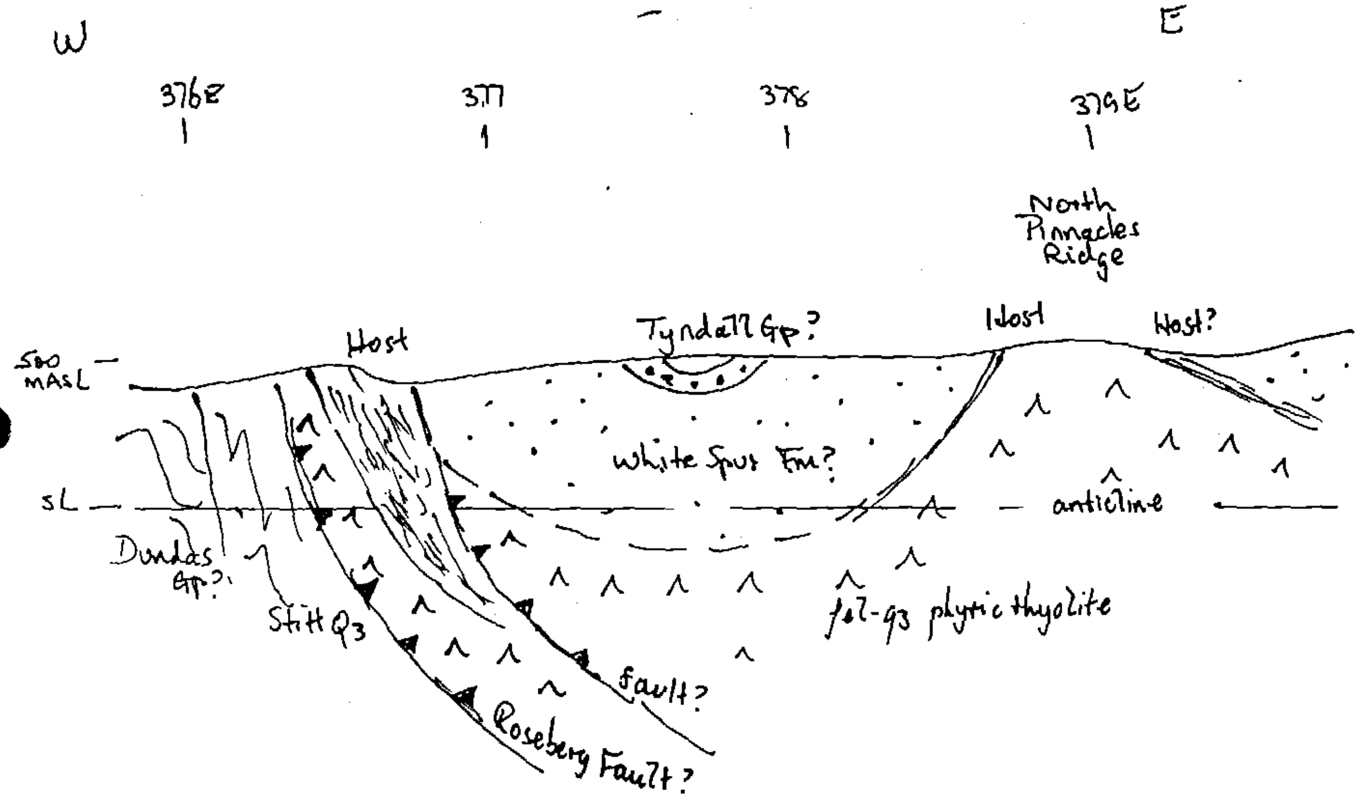


COMBINATION MAP: RESIDUAL BOUGUER ANOMALIES AND OBSERVED MAGNETIC FIELD

FIGURE 14

012094

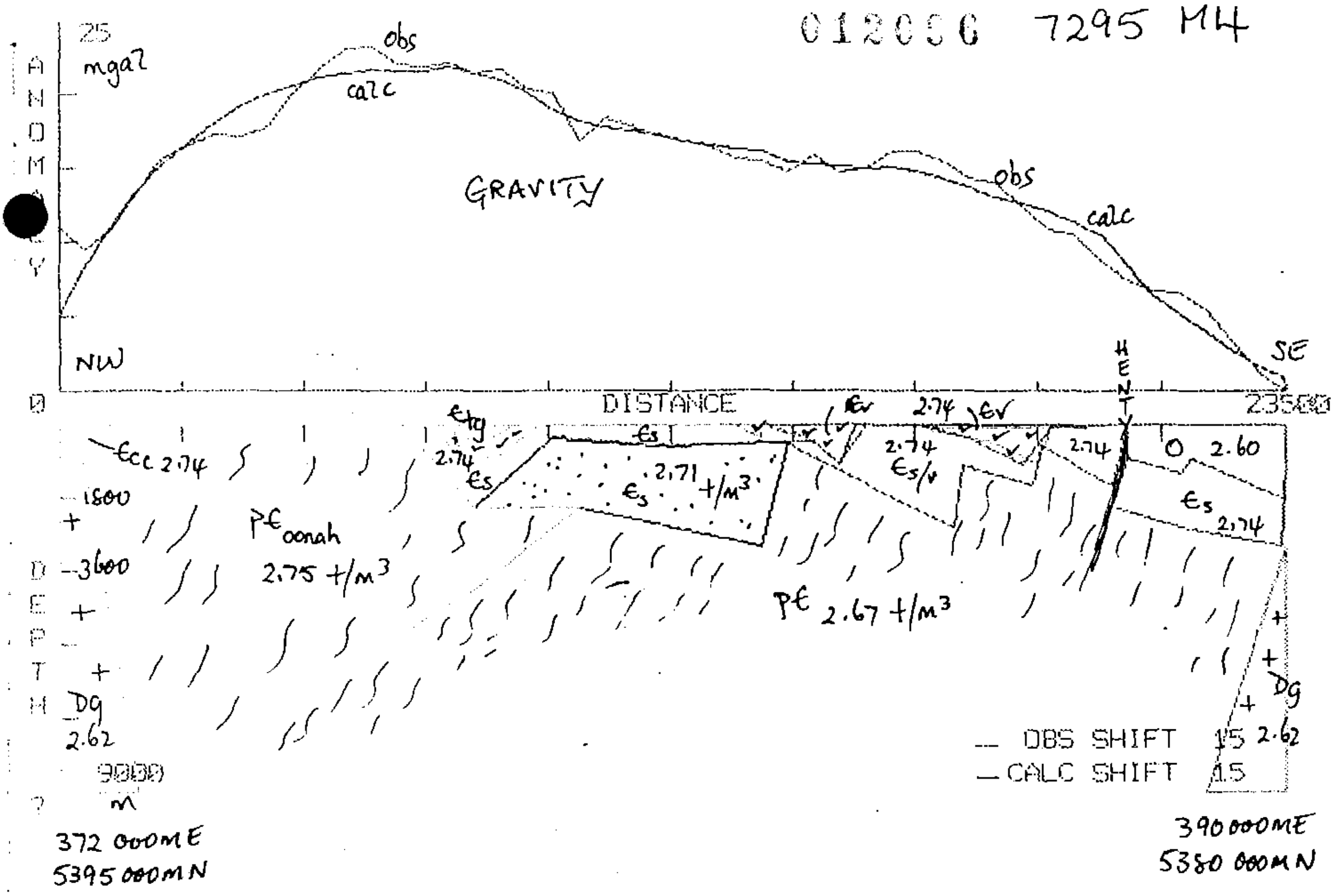
012095

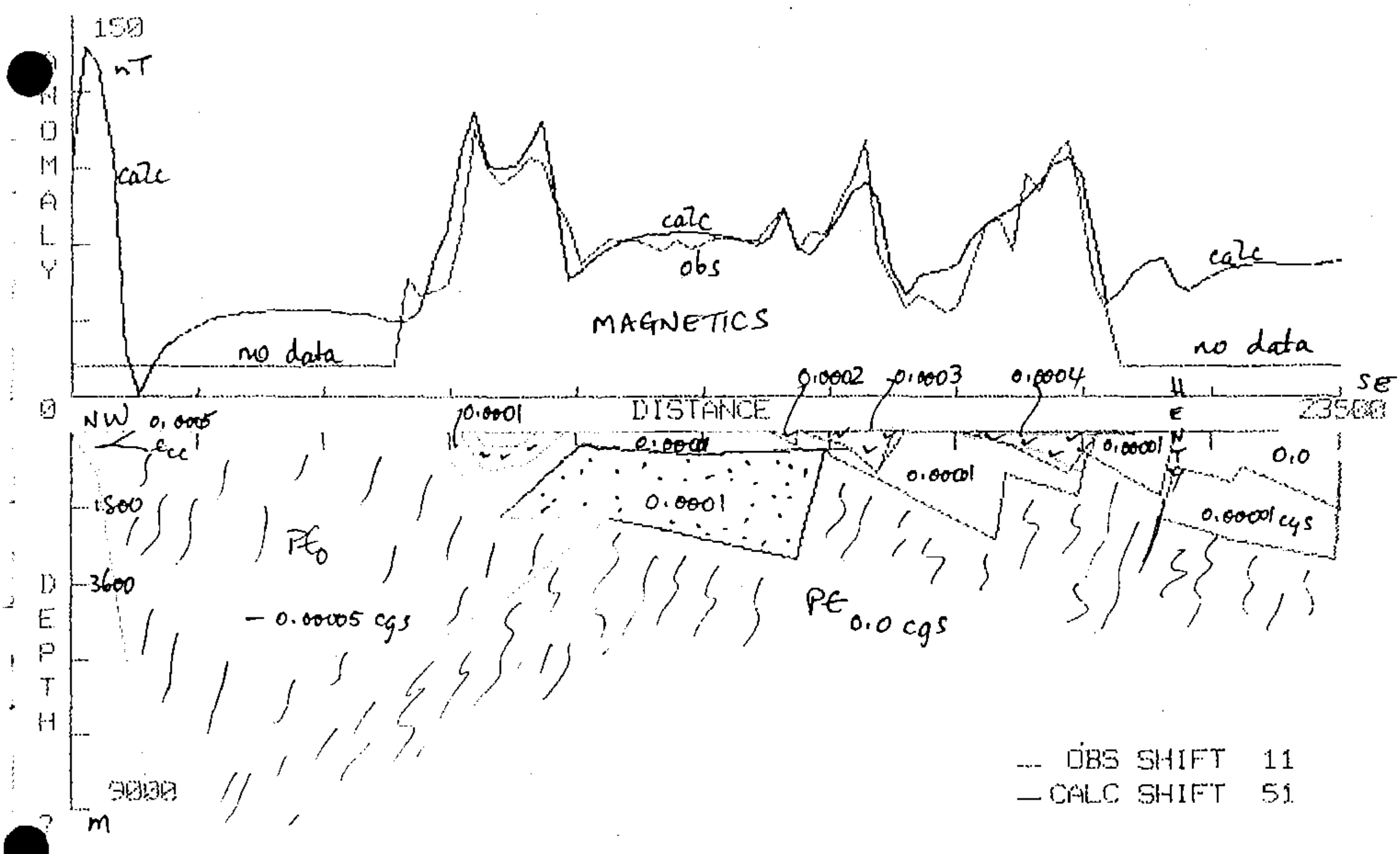


STRUCTURAL/STRATIGRAPHIC CONCEPT FOR THE PINNACLES AREA
(AFTER R. POLTOCK)

FIGURE 15

012056 7295 M4





04/93

REGIONAL MODEL - MEREDITH TO TOR GRANITES
372 000/5395 000 TO 390 000/5380 000

FIGURE 16

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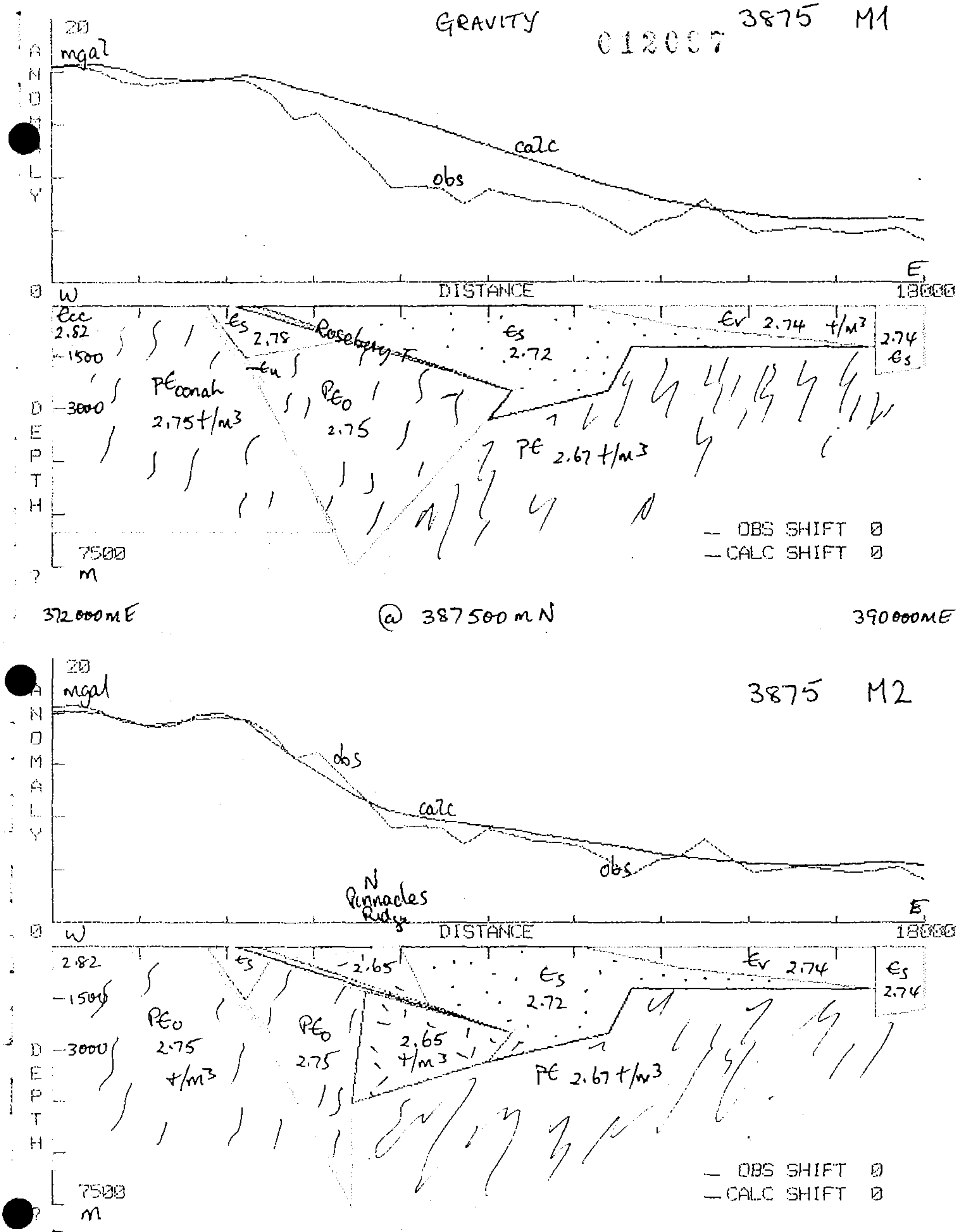

DL 20/04/93

LINE 387 500 MN - GRAVITY MODELS

FIGURE 17

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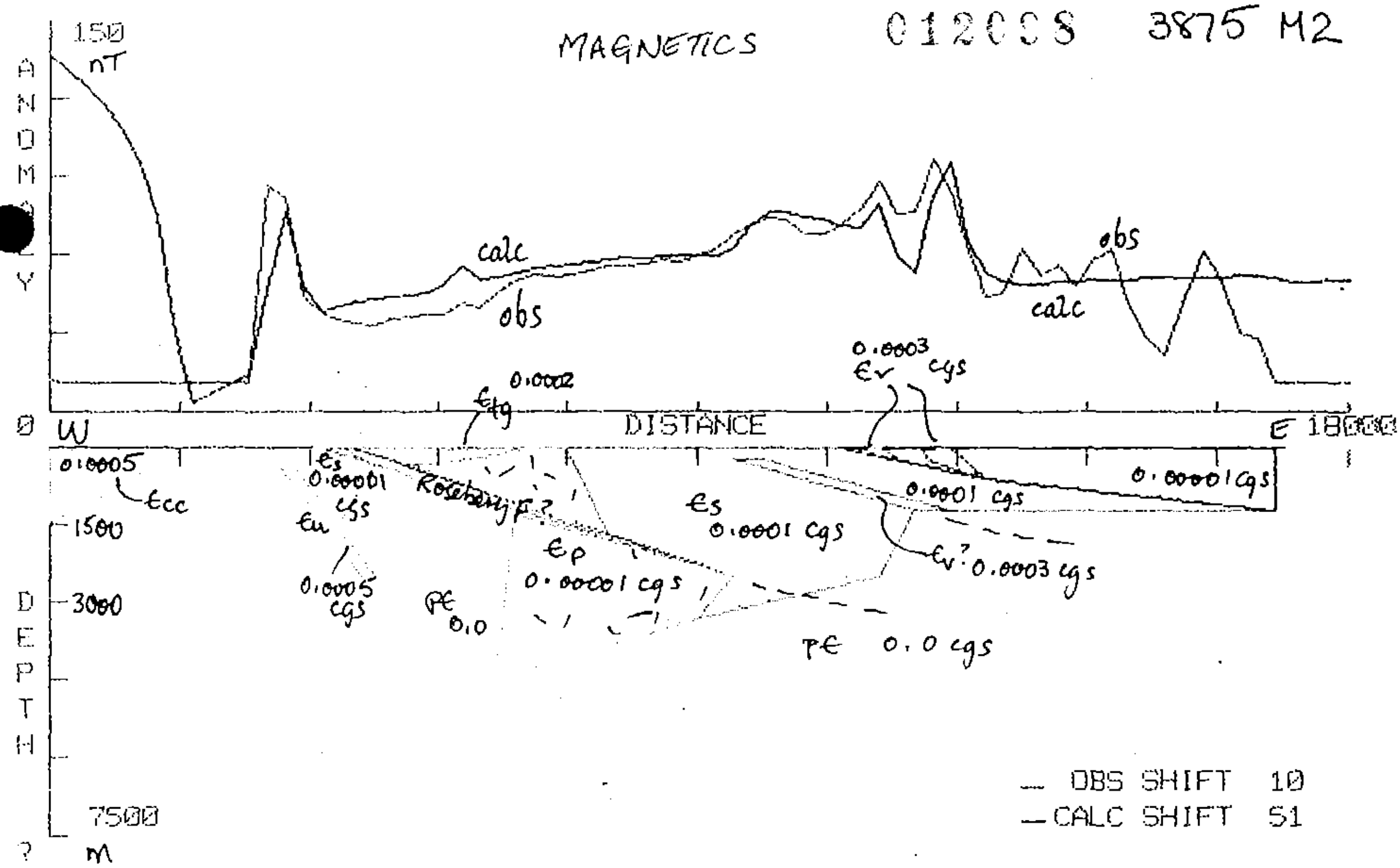
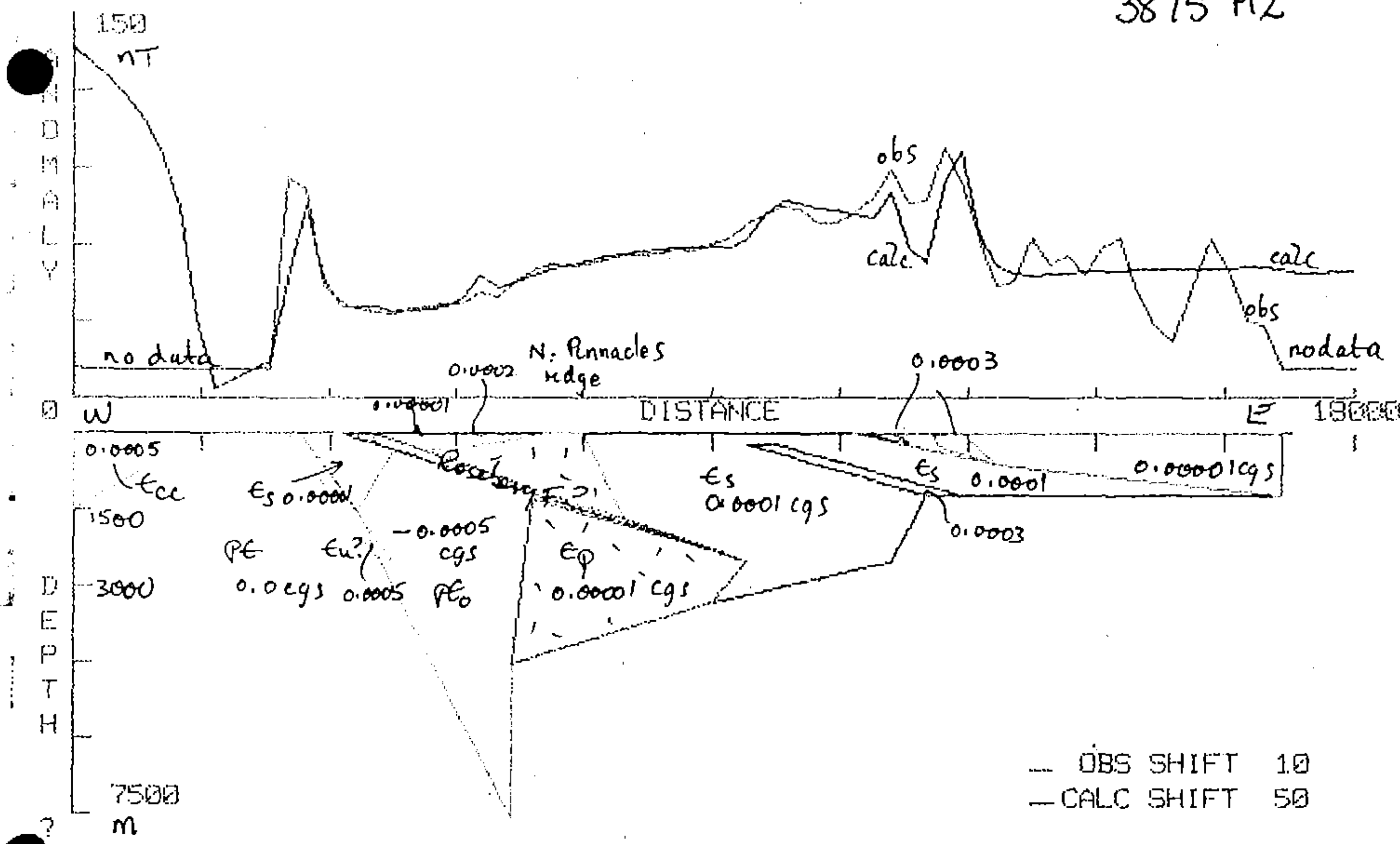
Hobart, Tasmania 7001

MAGNETICS 012008 3875 M2



372000mE @ 387500mN 390000mE

3875 M2'



DG 04/93

LINE 387 500 MN - MAGNETICS MODELS FIGURE 18

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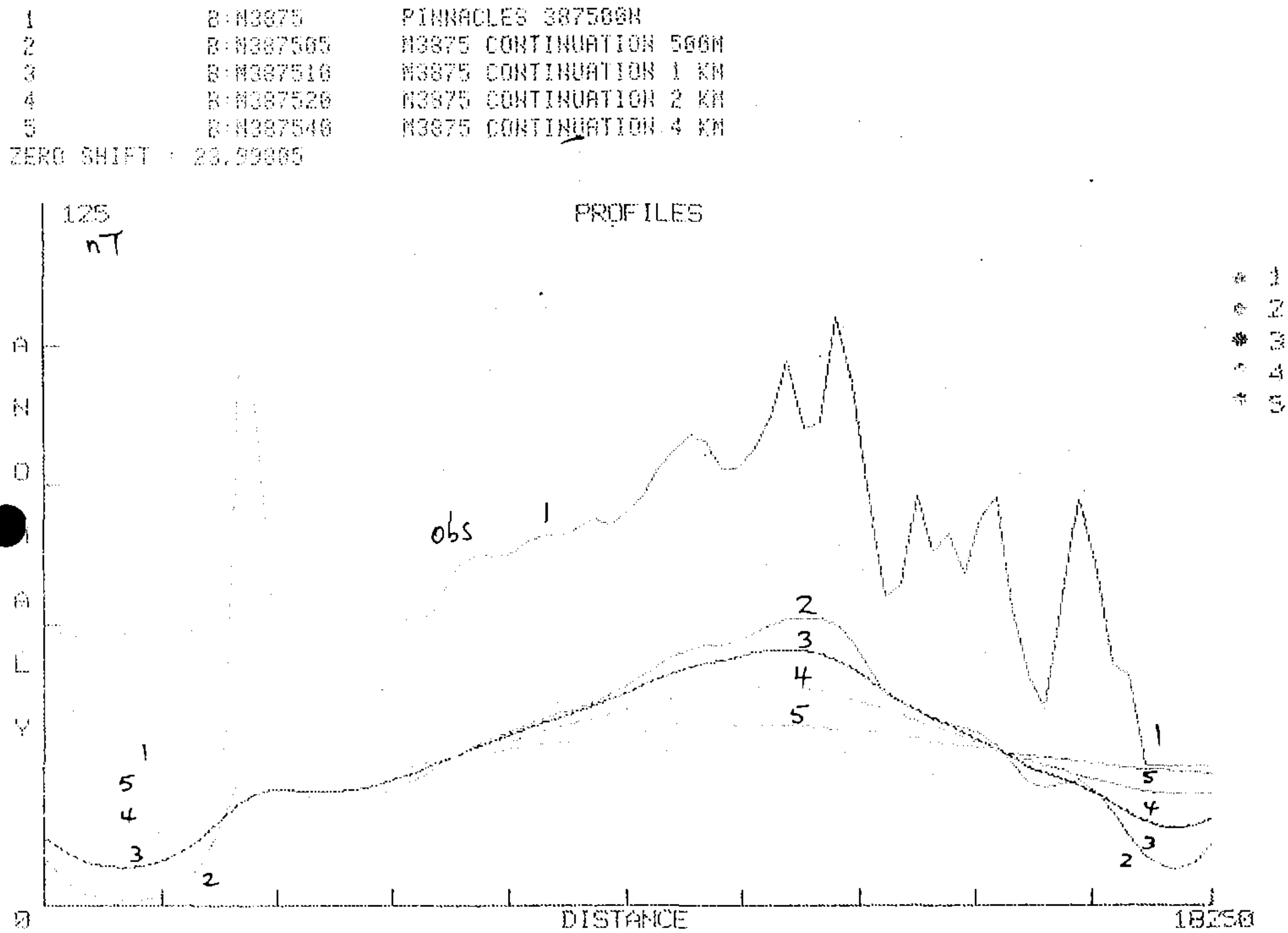
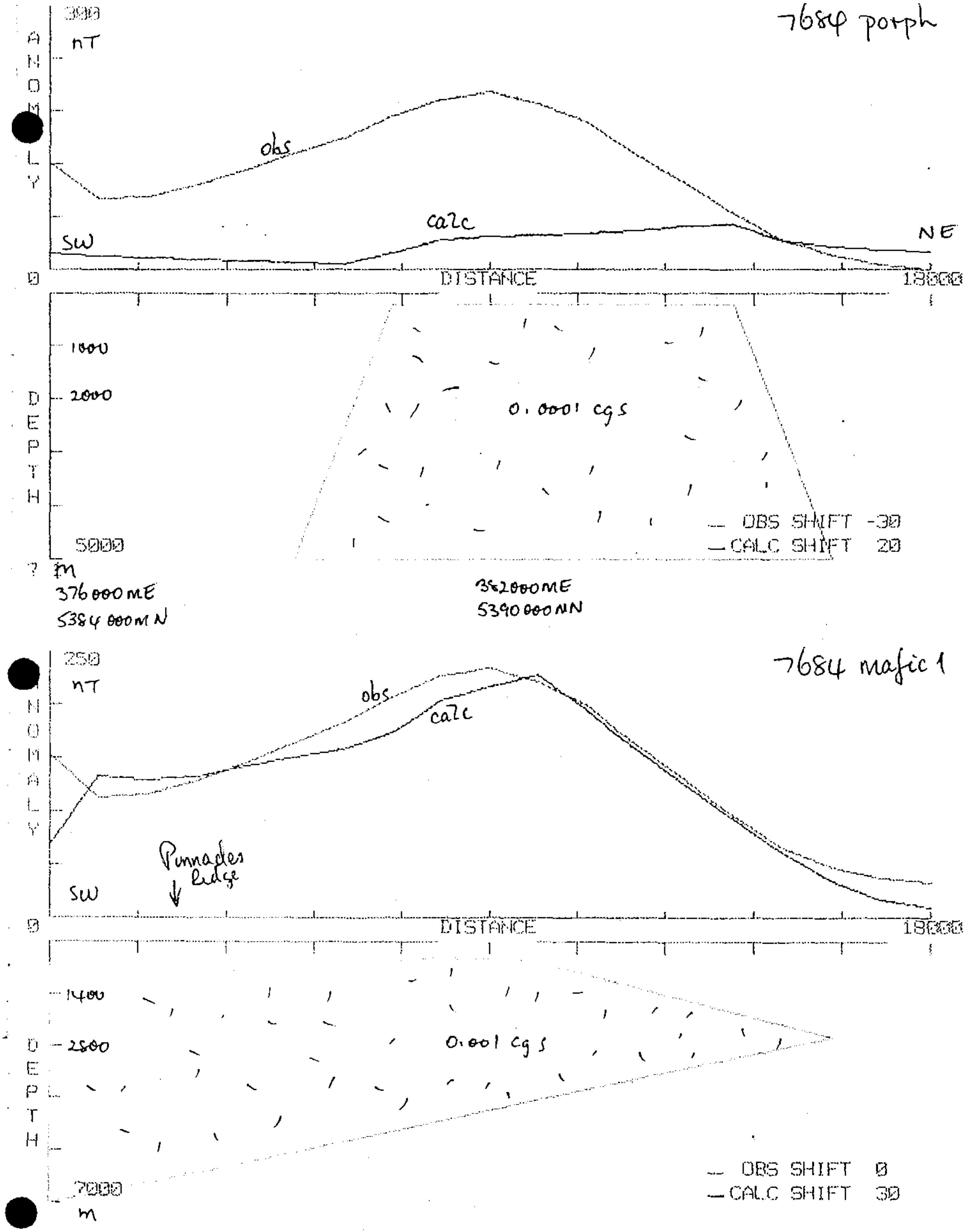
Hobart, Tasmania 7001



LINE 387 500 MN - EFFECT OF CONTINUATION OR DEPTH OF BURIAL
FIGURE 19

012100



04/93

LINE 7684 - OPTIONS 1 AND 2 - REGIONAL MAGNETIC ANOMALY

FIGURE 20

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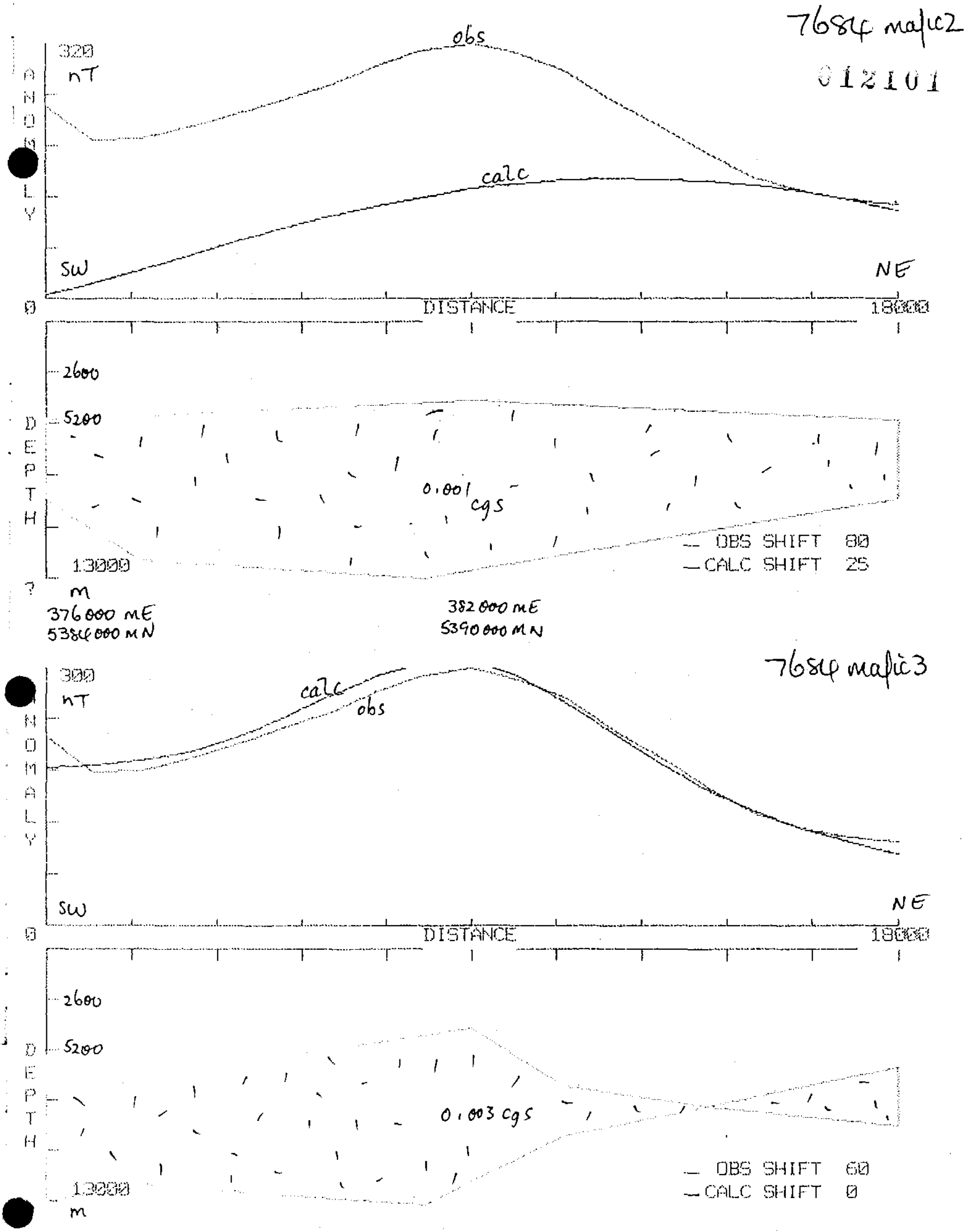
Hobart, Tasmania 7001



LINE 7684 - OPTIONS 3 AND 4 - REGIONAL MAGNETIC ANOMALY

FIGURE 21

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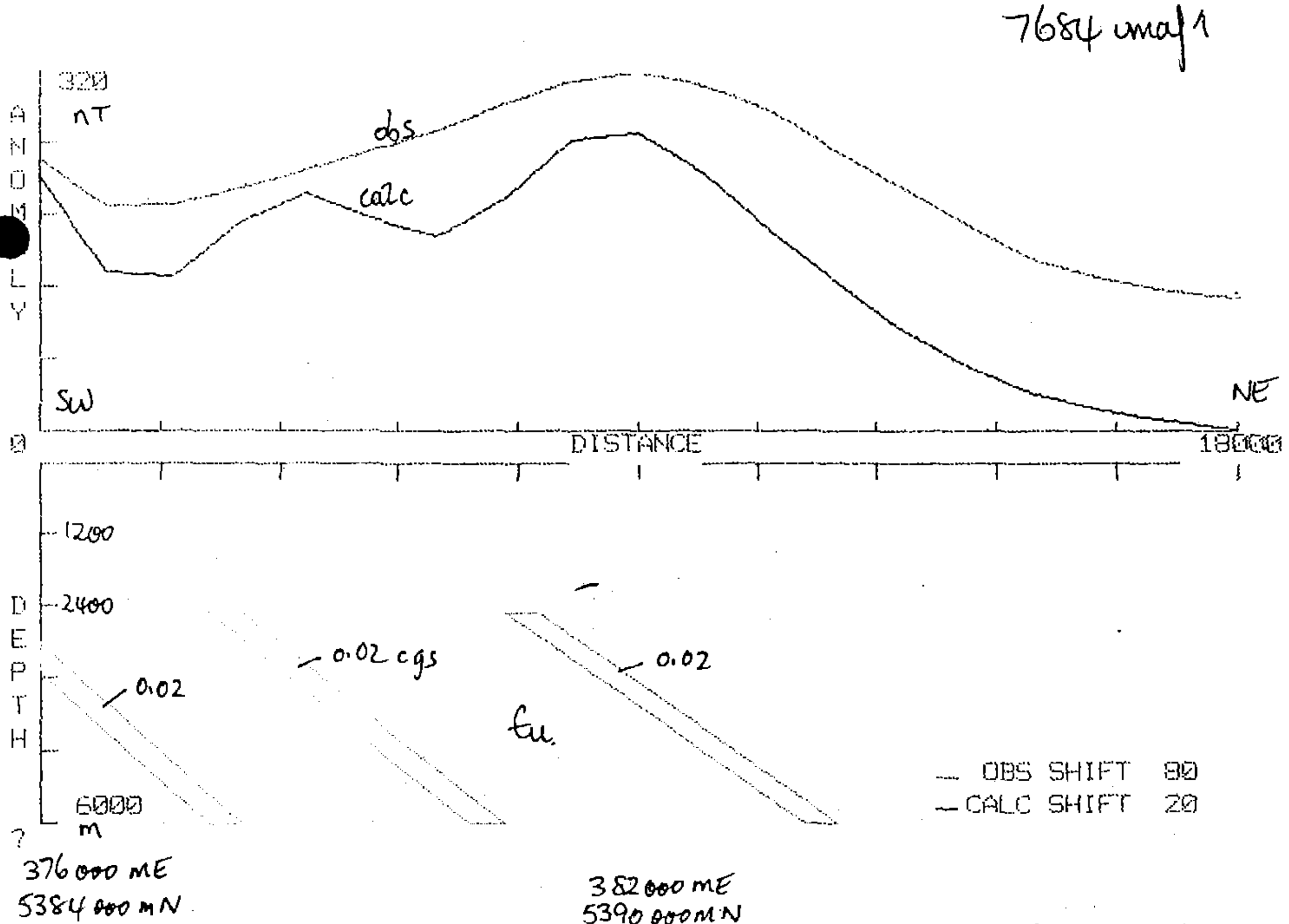
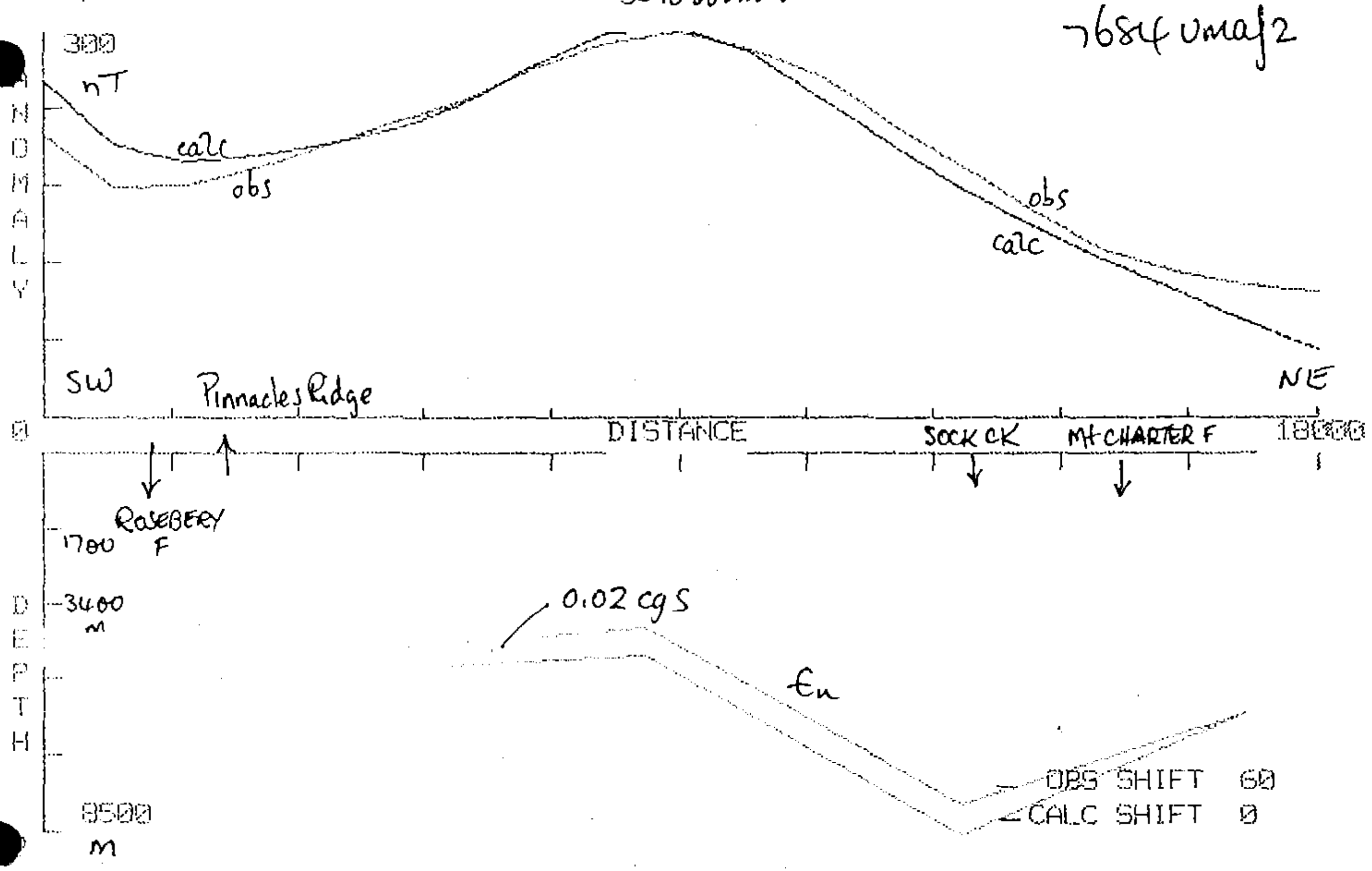
Hobart, Tasmania 7001





DEL 04/93

LINE 7684 - OPTIONS 5 AND 6 - REGIONAL MAGNETIC ANOMALY

FIGURE 22

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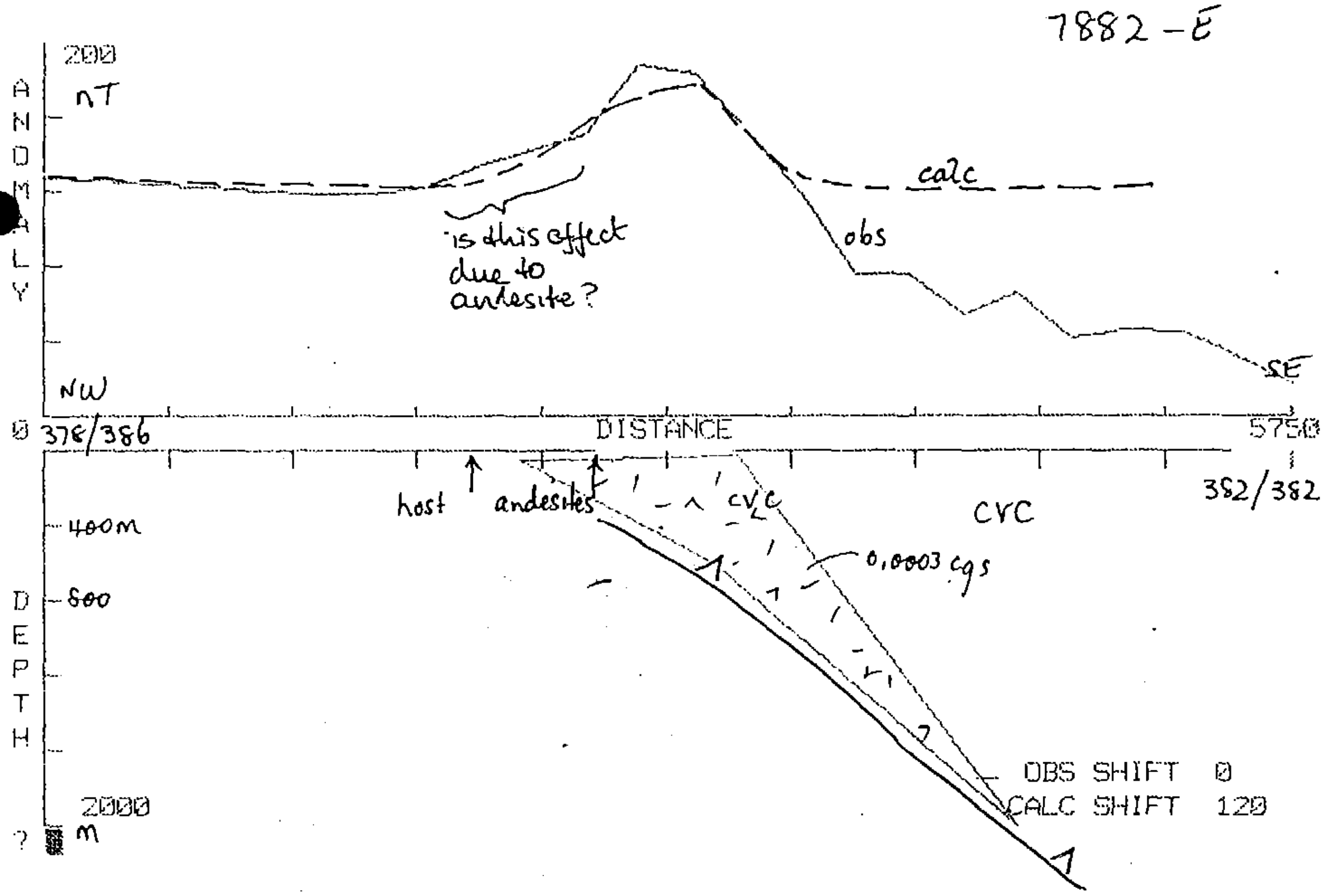
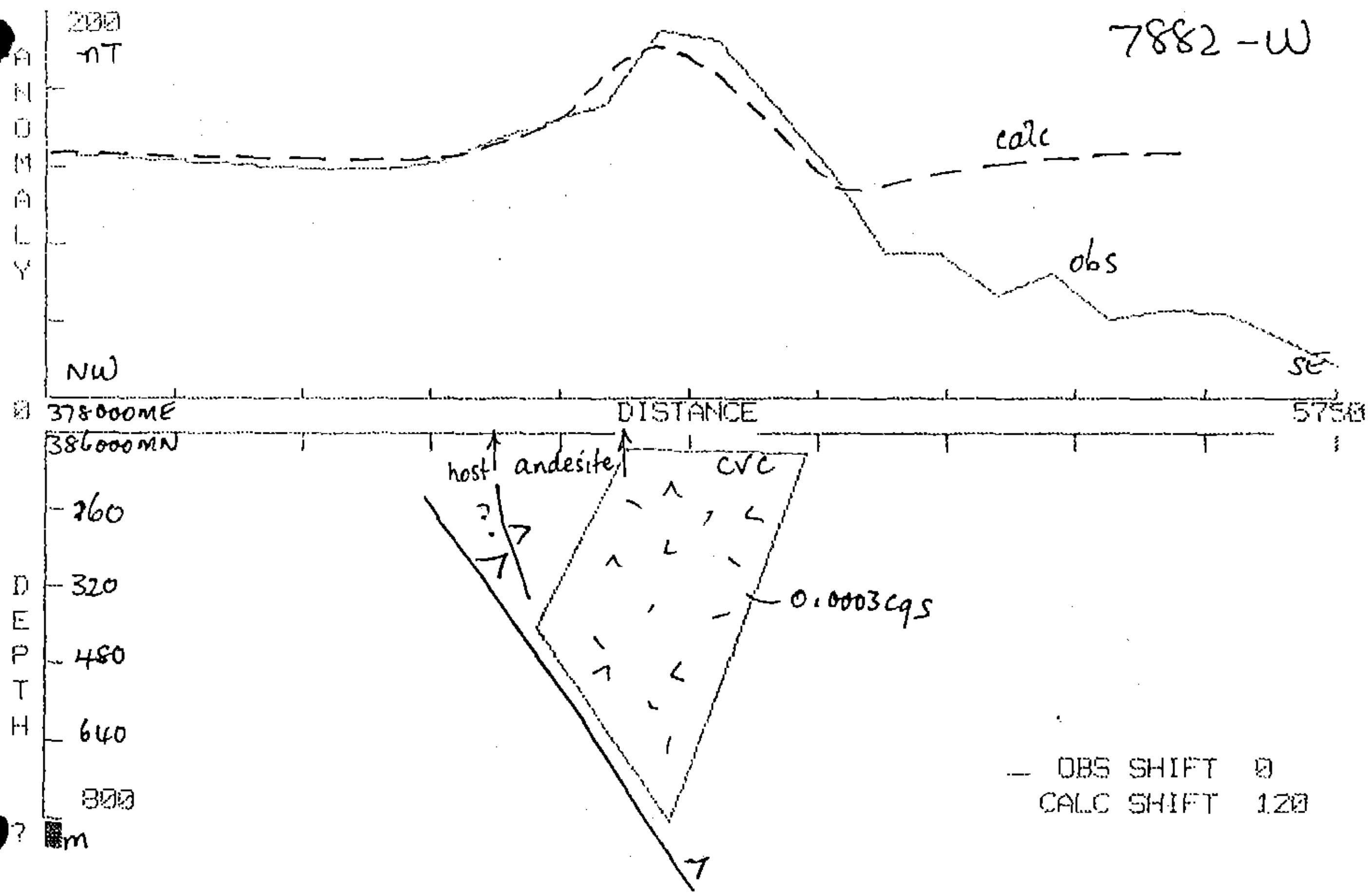
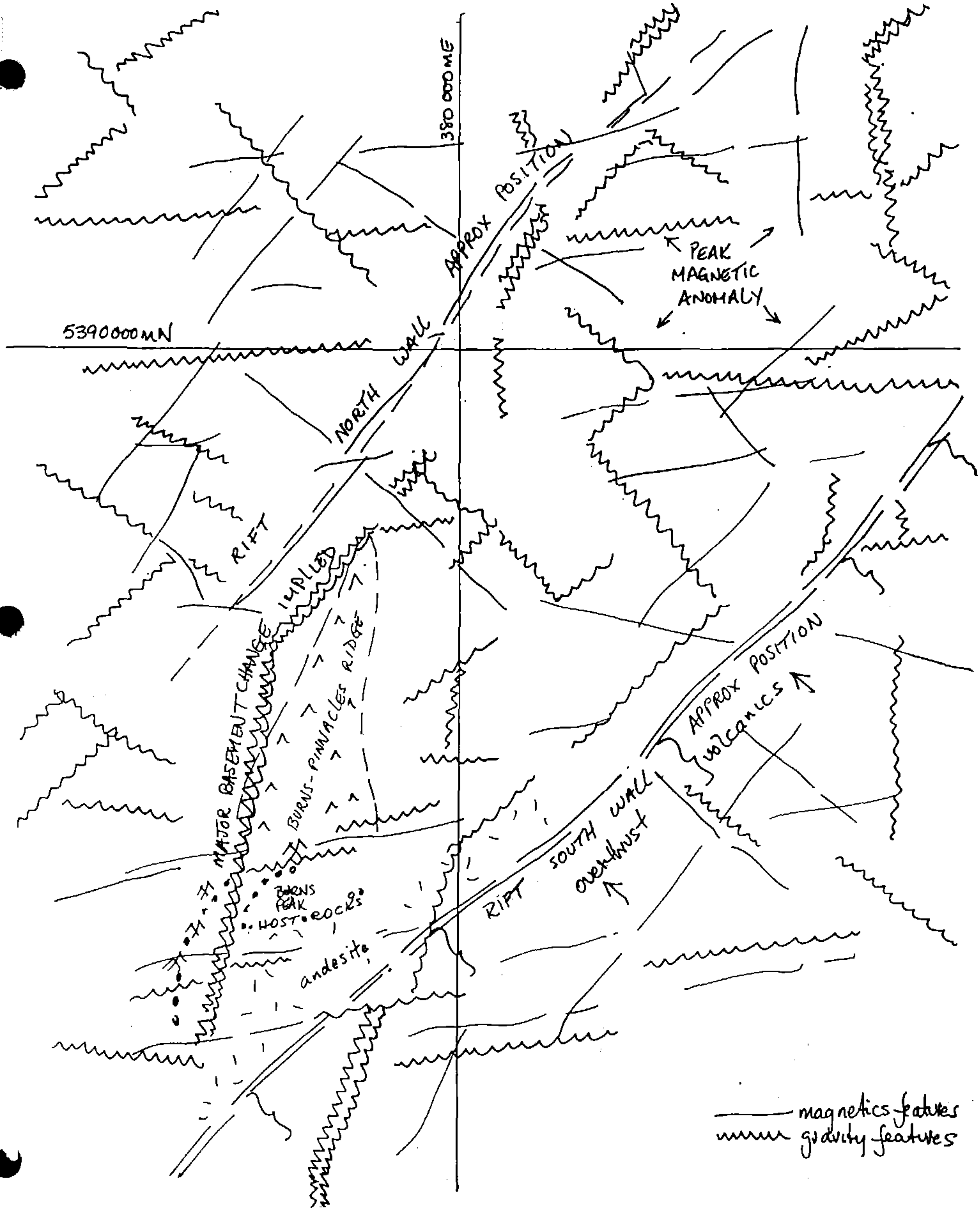




HOLLWAY ANDESITE - POSSIBLE STRUCTURAL RELATIONSHIPS FIGURE 23



SUMMARY OF MAJOR STRUCTURAL ELEMENTS

FIGURE 24

012104

APPENDIX IV

IP SURVEY

012106

PASMINCO
EXPLORATION

A Division of Pasminco Australia Limited.
(Incorporated in Victoria)

Old Burnie Railway Station,
(off Marine Terrace)
Postal Address:
P.O. Box 886, Burnie
Tasmania, Australia, 7320
A.C.N. 004074962

MEMORANDUM

TO: R Poltock
FROM: NA Hughes
DATE: 12th May 1993
FILE: EP/02/3009
SUBJECT: Interpretation of Induced Polarisation and Resistivity survey results from on BOCO EL 2/90 and EL 4/90

Introduction

During February, 1993 Scintrex Ltd of Perth were contracted to perform Induced Polarisation and Resistivity Surveys on Pasminco's BOCO grid, EL 2/90 and EL 4/90.

Eight lines were surveyed for a total of 16.8 line kilometres (MAP 1). The line separation on the grid is 400m. A pole-dipole array was used with a dipole separation of 100m and 6 dipoles separations recorded at each station (n = 1 to 6). For all lines the travel direction was from west to east with the current injection point east of the measuring array. The survey was stopped before completion because of poor weather conditions and equipment breakdown. Line 12800N remains to be surveyed.

The equipment used for the surveys were an IPR12, Time Domain Receiver, and a TSQ3, Time Domain Square Wave Generator, Transmitter. The transmitter cycle consisted of an interrupted square wave (2 seconds ON : 2 seconds OFF : 2 seconds ON reversed polarity : 2 seconds OFF)

Several of the data points have been interpreted to be invalid, due to current leakage or poor placement of porous pots (used in the measurement of the dipole potential), and as such neglected.

The data is interpreted in conjunction with a 1979 Aberfoyle IP/Resistivity survey on a grid directly south of the BOCO grid (MAP 1). The details of this survey can be found in Open File 79-1380. This survey used a dipole-dipole array with a dipole separation of 50m, and 6 dipole separations recorded at each station, and was done with Frequency Domain equipment.

Telephone (004) 317 477 Facsimile (004) 318 949

Interpretation of Results

The data from both surveys have been compiled onto a compilation plan map (MAP 1) at a scale of 1 : 25000. The map shows the survey lines, chargeability anomalies and zones, and resistivity trends. Interpreted and mapped geological boundaries of the units of interest; the Pinnacles Rhyolite and the base of the White Spur Formation are shown on Fig 5(annual report). The data from the 1993 survey is also presented as stacked pseudosections of the M10 (mV/V) chargeability channel and Apparent Resistivity (ohm-m), at a scale of 1 : 5000.

The 1979 Aberfoyle survey detected several anomalous responses within, or at the contact of the Pinnacles Rhyolite and the Quartz Crystal Sandstone. The best defined and strongest anomaly is on line 4100N at 5000E to 5100E with an amplitude of 4 pfe. Responses on all lines indicate the cause of the anomalies to be close to surface (less than one dipole separation) and mostly depth limited. The low chargeability zone to the west of the grid correlates to the Stitt Quartzite.

The objectives of the Pasminco IP survey was to map the extension of the Pinnacles Rhyolite chargeability anomalism north of the Aberfoyle grid and also to test for chargeability anomalies at the base of the White Spur Formation.

A review of the chargeability pseudo cross sections indicates that no significant anomalies were detected with the survey. A compilation of chargeability anomalies is given on MAP 1. They are graded as weak and moderate. A moderate anomaly is one that has a well defined shape and amplitude double that of background. A weak anomaly is defined by chargeabilities greater than background. Anomalies showing line to line correspondence and having similar features have been grouped into zones.

Zone A

On the main BOCO grid there is an increase in chargeability to the southwest, east of the baseline and south of line 11200N, with the best responses on lines 10400N and 10800N at 10600E to 10800E, with amplitudes of 14 mV/V for channel 10.

This zone appears to correlate to the zone of increased chargeability mapped on the Aberfoyle grid. The fact that the zone is not associated with the Pinnacles Rhyolite indicates the source of the anomalism may be related to NW and NE faulting, as indicated by mapping and aeromagnetics (see Fig 6 annual report).

Zone B

Zone B is defined across three lines with the strongest response on line 12400N, amplitude 11 mV/V. This zone appears to be entirely within the Stitt Quartzite although it may mark the boundary with the Southwell subgroup.

Zone C

Zone C is interpreted on two lines, with the strongest response on line 12400N, amplitude 11mV/V, and appears to be associated with a subtle magnetic high trend.

Lines 10400N and 14000N

Both lines, west of 11000E, have increased background chargeability values. There is no clear chargeability anomaly at the base of the White Spur Formation on either line, although there is a slight increase at the contact.

There is little variation in resistivity values across the grid. However, a slight increase in resistivity to depth near 10400E on lines 10000N to 11600N may indicate a silicified fault or cross structure. A slight decrease in resistivity values to the west of the grid may map a fault zone or the boundary of the Stitt Quartzite and the Southwell Subgroup.

Conclusions

The Induced Polarisation and Resistivity survey on the BOCO grid failed to detect any strong chargeability or resistivity (lows or highs) anomalies.

There was no chargeability anomalies associated with the Pinnacles Rhyolite north of the Aberfoyle grid.

There was reasonable correlation between the Aberfoyle IP data and the present survey data where the grids overlapped.

The base of the White Spur Formation appears to be weakly chargeable, with respect to background, on the lines surveyed.

Zone A appears to be terminated to the north by a NW trending structure (see Fig.6 Annual Report).

Zone B appears to be at the contact of the Stitt Quartzite and the Southwell Subgroup.

Zone C appears to be related to a magnetic high trend within the Southwell Subgroup.

Recommendations

1. The IP data be compared to geochemistry results. It is expected that since the source of the IP anomalies is shallow that those of interest should have a correlateable geochemical anomaly.

2. Correlate percentage metallic sulphides from areas of known mineralisation and areas of barren mineralisation to those measured with the IP method to determine if further surveying would be useful.

3. The lack of a clear anomalous IP signatures at the base of the White Spur Formation or from the Pinnacles Rhyolite do not negate the further use of the IP/Resistivity method as long as there is minimal sulphides associated with those areas already surveyed.

REFERENCES

Taylor J.F., 1979 Aberfoyle Exploration. Marionoak River EL 22/74 Tasmania. Report for year ending August, 1979. Open File Report 79-1380

KEYWORDS and LOCALITY

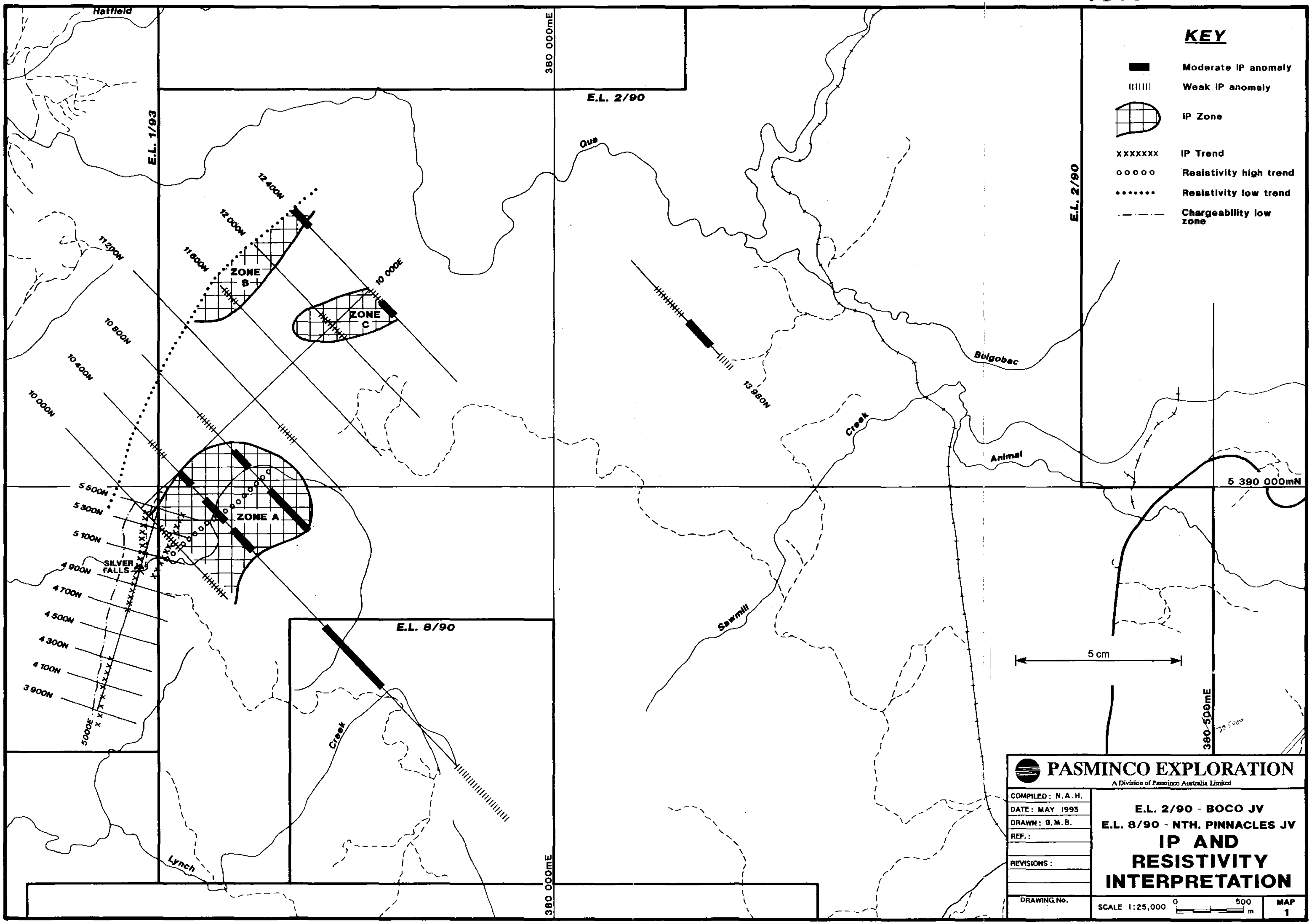
BOCO, SILVERFALLS, ABERFOYLE, INDUCED POLARISATION, RESISTIVITY, POLE-DIPOLE, DIPOLE-DIPOLE, TIME DOMAIN, FREQUENCY DOMAIN, PFE, OHM-M, mV/V, AEROMAGNETICS, STITT QUARTZITE, PINNACLES RHYOLITE, QUARTZ CRYSTAL SANDSTONE, WHITE SPUR FORMATION, LYNCHFORD TUFF, SOUTHWELL SUBGROUP

APPENDIX

Time gates for the IPR12 IP Receiver

All times in milliseconds, measured from the end of the ON cycle.

Slice	Start	End
4	50	70
5	70	110
6	110	150
7	150	230
8	230	310
9	310	450
10	450	590
11	590	820
12	820	1050
13	1050	1410
14	1410	1770


KEY
Moderate IP anomaly
Weak IP anomaly
IP Zone
xxxxxxx IP Trend
ooooo Resistivity high trend
Resistivity low trend
Chargeability low zone
Hatfield
E.L. 1/93
E.L. 2/90
E.L. 8/90
380 000mE
380 500mE
5 390 000mN
Que
Bulgobac
Animal
Creek
Sawmill
Lynch
ZONE A
ZONE B
ZONE C
SILVER FALLS
12 400N
12 000N
11 600N
11 200N
10 800N
10 400N
10 000N
10 000E
13 980N
5 500N
5 300N
5 100N
4 900N
4 700N
4 500N
4 300N
4 100N
3 900N
5000E
5 cm
PASMINCO EXPLORATION
A Division of Pasminco Australia Limited
COMPILED: N.A.H.
DATE: MAY 1993
DRAWN: G.M.B.
REF.:
REVISIONS:
DRAWING No.
E.L. 2/90 - BOCO JV
E.L. 8/90 - NTH. PINNACLES JV
IP AND RESISTIVITY INTERPRETATION
SCALE 1:25,000
0
500
m
MAP 1

012111

Pasminco Exploration Ltd

BOCO, EL2/90
Silver Falls Grid

Survey Parameters

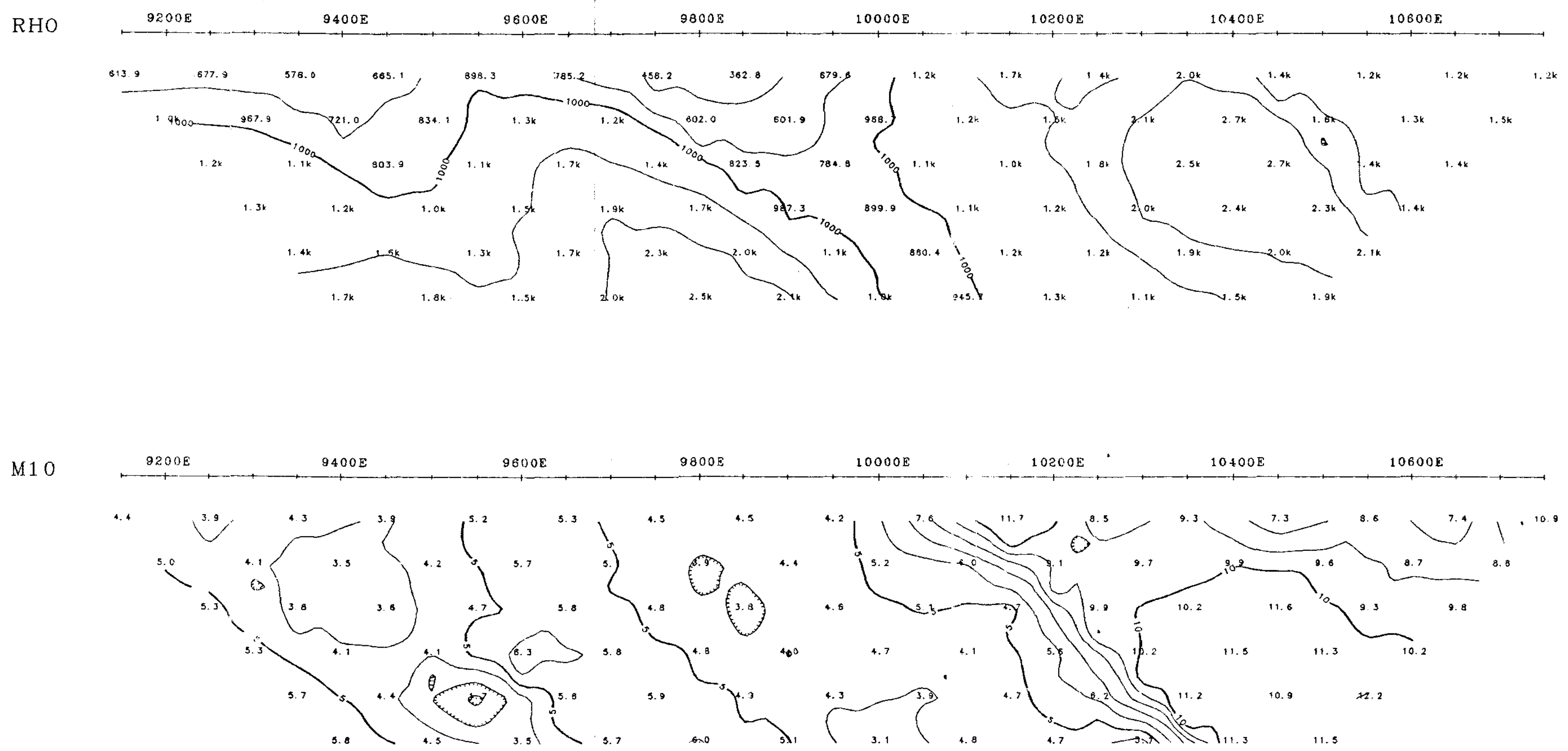
Pole-dipole Array
a = 100m; n = 1 to 6
TD - East; C1 - East
Equip : IPR12/TSQ3
Timing: 2s ON:2s OFF
Survey : March, 1993

5 cm

Line 10000N

Scale 1 : 5000

IP & Resistivity Survey



LINE10 OOON

012112

Pasminco Exploration Ltd

BOCO, EL2/90
Silver Falls Grid

Survey Parameters

Pole-dipole Array
a = 100m; n = 1 to 6
TD - East; C1 - East
Equip : IPR12/TSQ3
Timing: 2s ON:2s OFF
Survey : March, 1993

Line 10400N

5cm

Scale 1 : 5000

IP & Resistivity Survey

LINE 10 400N

C12113

Pasminco Exploration Ltd

BOCO, EL2/90
Silver Falls Grid

Survey Parameters

Pole-dipole Array
a = 100m; n = 1 to 6
TD - East; C1 - East
Equip : IPR12/TSQ3
Timing: 2s ON: 2s OFF
Survey : March, 1993

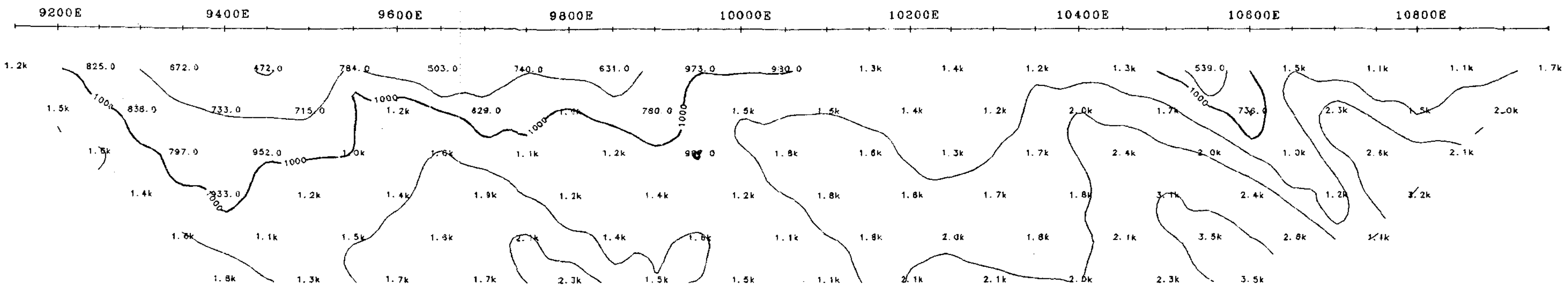
Line 10800N

5 cm

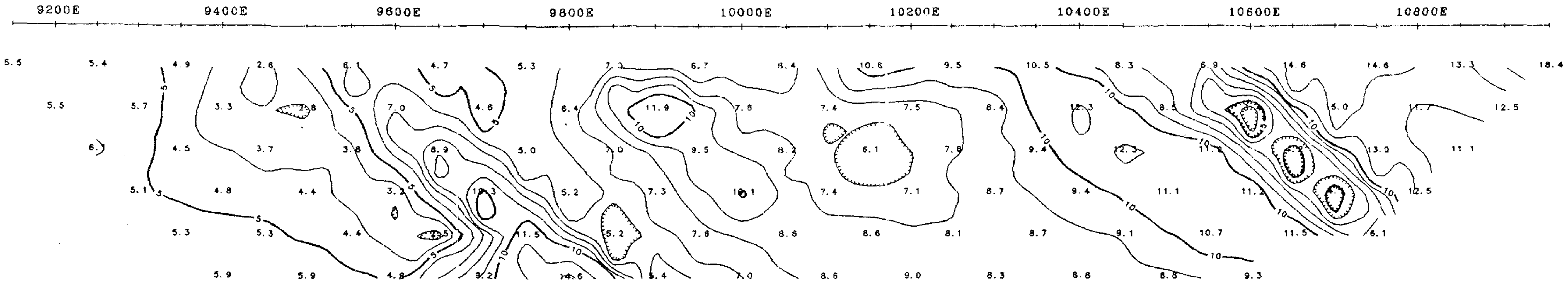
Scale 1 : 5000

IP & Resistivity Survey

RHO



M10



LINE 10 800N

012114

Pasminco Exploration Ltd

BOCO, EL2/90
Silver Falls Grid

Survey Parameters

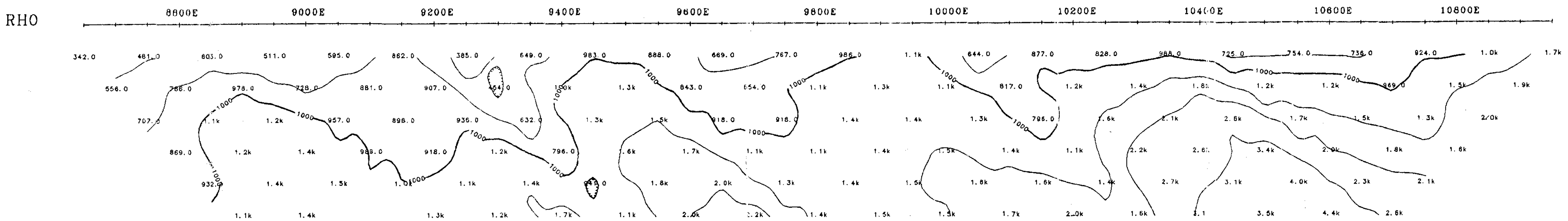
Pole-dipole Array
a = 100m; n = 1 to 6
TD - East; C1 - East
Equip : IPR12/TSQ3
Timing: 2s ON: 2s OFF
Survey : March, 1993

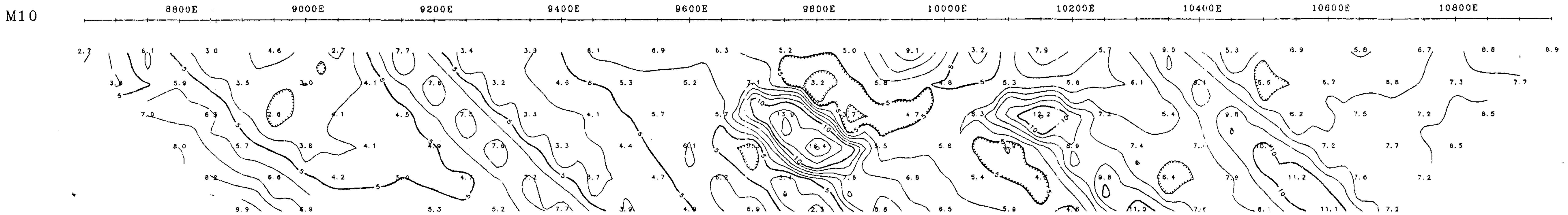
Line 11200N

5 cm

Scale 1 : 5000

IP & Resistivity Survey





LINE 11 200N

012113

Pasminco Exploration Ltd

BOCO, EL2/90
Silver Falls Grid

Survey Parameters

Pole-dipole Array
a = 100m; n = 1 to 6
TD - East; C1 - East
Equip : IPR12/TSQ3
Timing: 2s ON:2s OFF
Survey : March, 1993

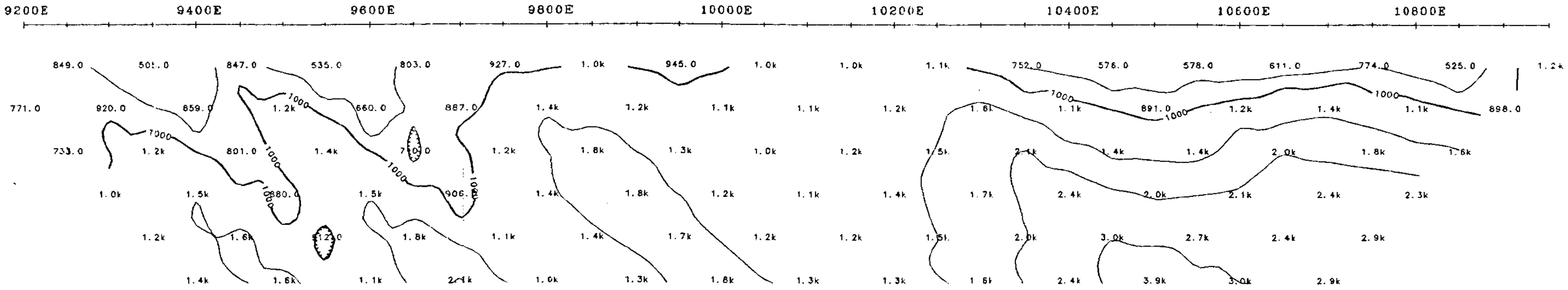
Line 11600N

5 cm

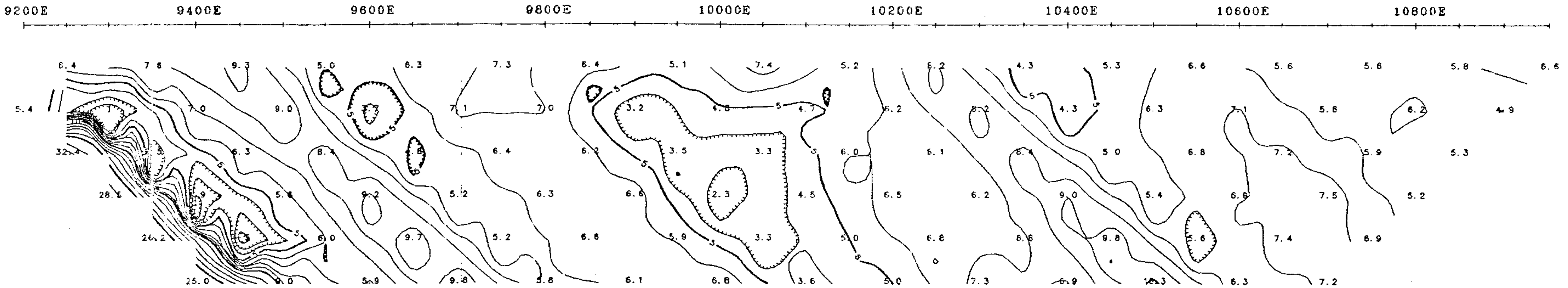
Scale 1 : 5000

IP & Resistivity Survey

RHO



M10



LINE 11 600N

012116

Pasminco Exploration Ltd

BOCO, EL2/90
Silver Falls Grid

Survey Parameters

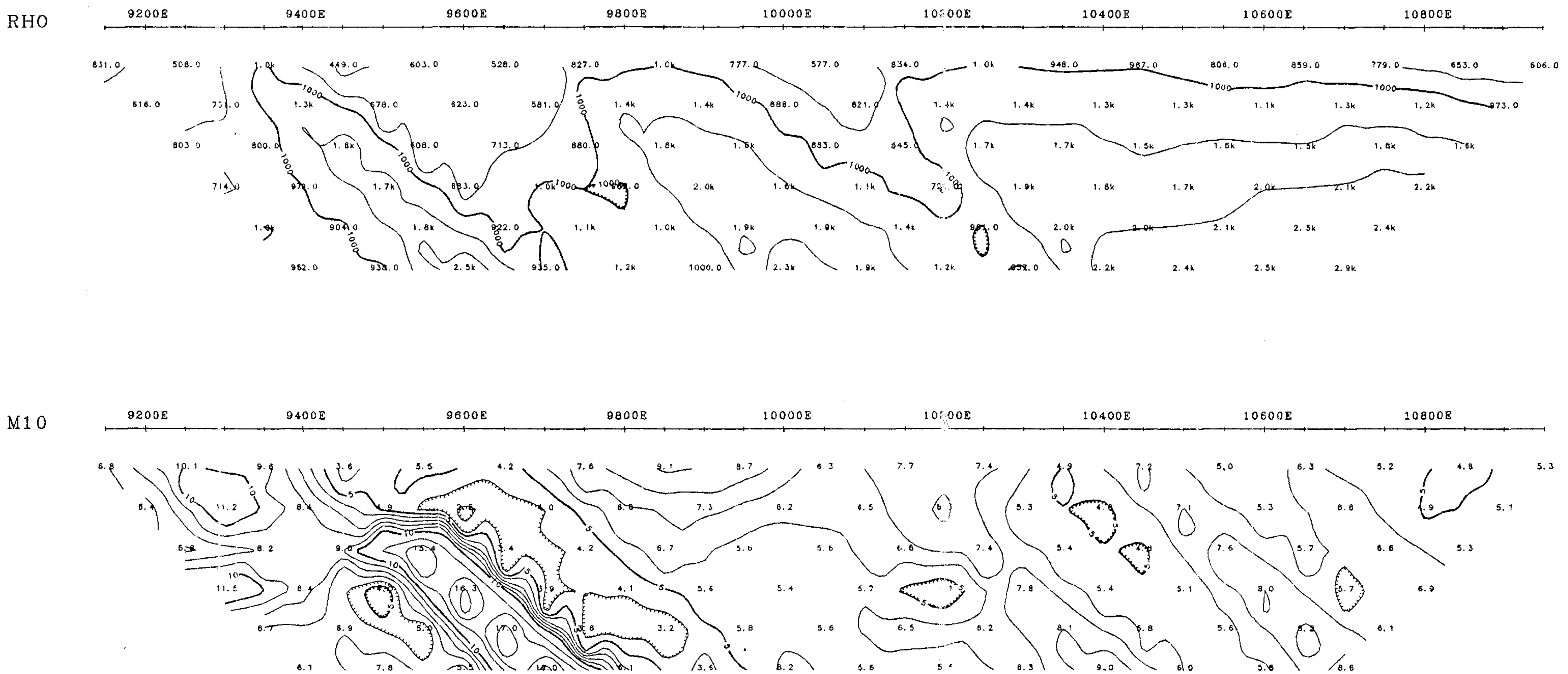
Pole-dipole Array
a = 100m; n = 1 to 6
TD - East; C1 - East
Equip : IPR12/TSQ3
Timing: 2s ON:2s OFF
Survey : March, 1993

Line 12000N

5 cm

Scale 1 : 5000

IP & Resistivity Survey



LINE 12 OOON

012117

Pasminco Exploration Ltd

BOCO, EL2/90
Silver Falls Grid

Survey Parameters

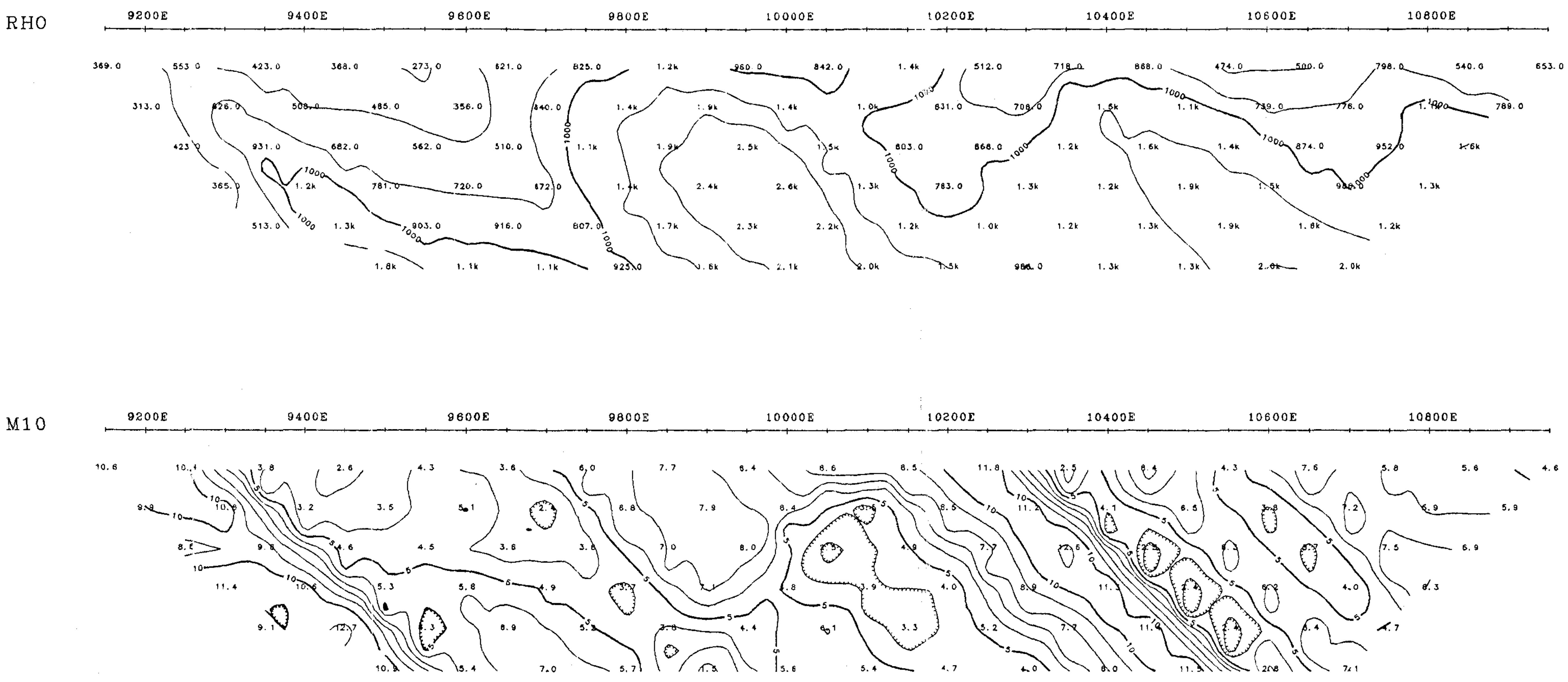
Pole-dipole Array
a = 100m; n = 1 to 6
TD - East; C1 - East
Equip : IPR12/TSQ3
Timing: 2s ON:2s OFF
Survey : March, 1993

Line 12400N

5 cm

Scale 1 : 5000

IP & Resistivity Survey



LINE 12 400N

012118

Pasminco Exploration Ltd

BOCO, EL2/90
Silver Falls Grid

Survey Parameters

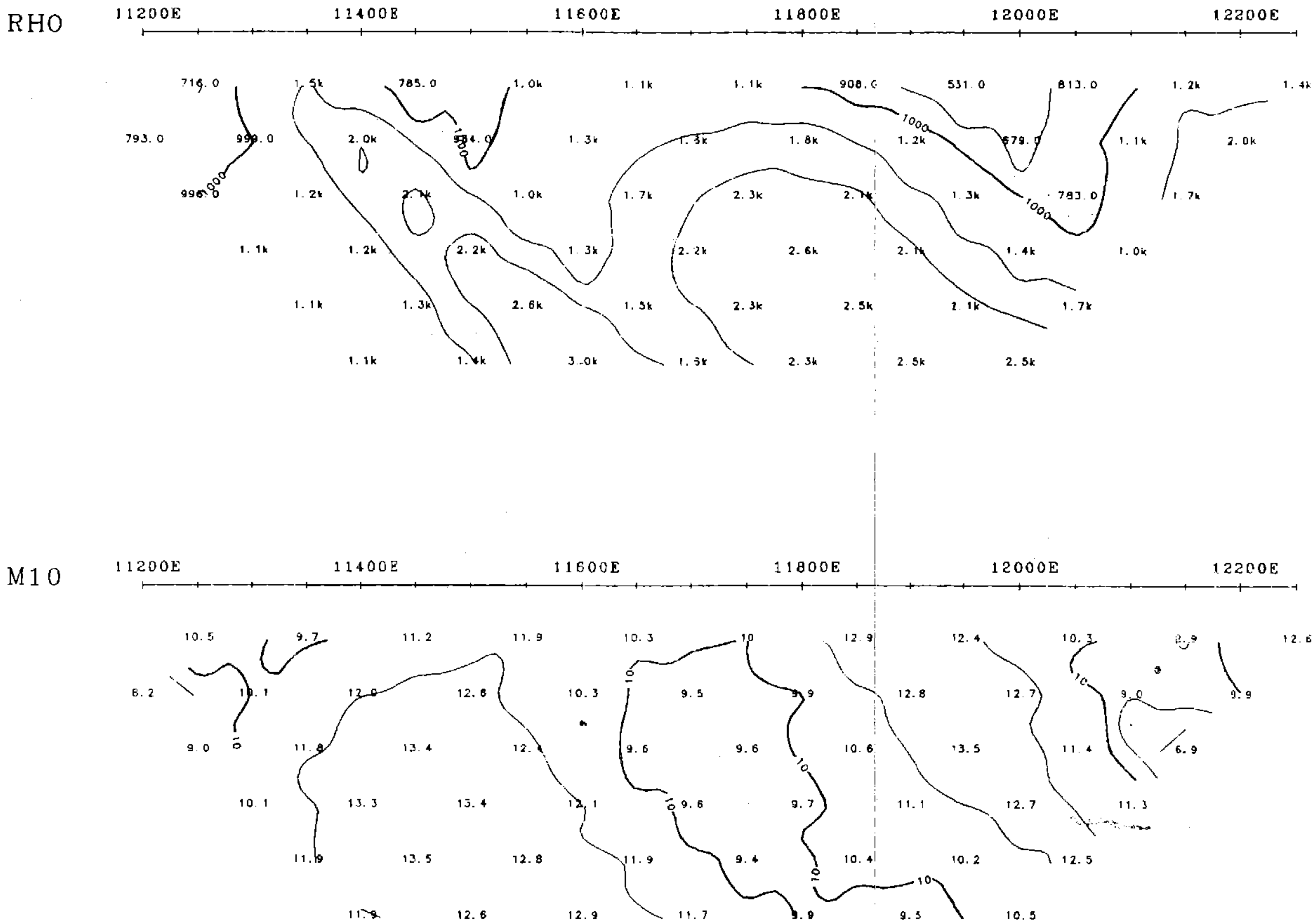
Pole-dipole Array
a = 100m; n = 1 to 6
TD - East; C1 - East
Equip : IPR12/TSQ3
Timing: 2s ON: 2s OFF
Survey : March, 1993

Line 14000N

5 cm

Scale 1 : 5000

IP & Resistivity Survey



LINE 14 000N

APPENDIX V

DHEM SURVEY AT BOCO, AK1

PASMINCO
EXPLORATION

A Division of Pasminco Australia Limited,
(Incorporated in Victoria)

Old Burnie Railway Station,
(off Marine Terrace)
Postal Address:
P.O. Box 886, Burnie
Tasmania, Australia, 7320
A.C.N. 004074962

MEMORANDUM

TO: LW Kirsner
FROM: NA Hughes
DATE: 14 April 1993
SUBJECT: **DHEM Survey at Boco, AK1**

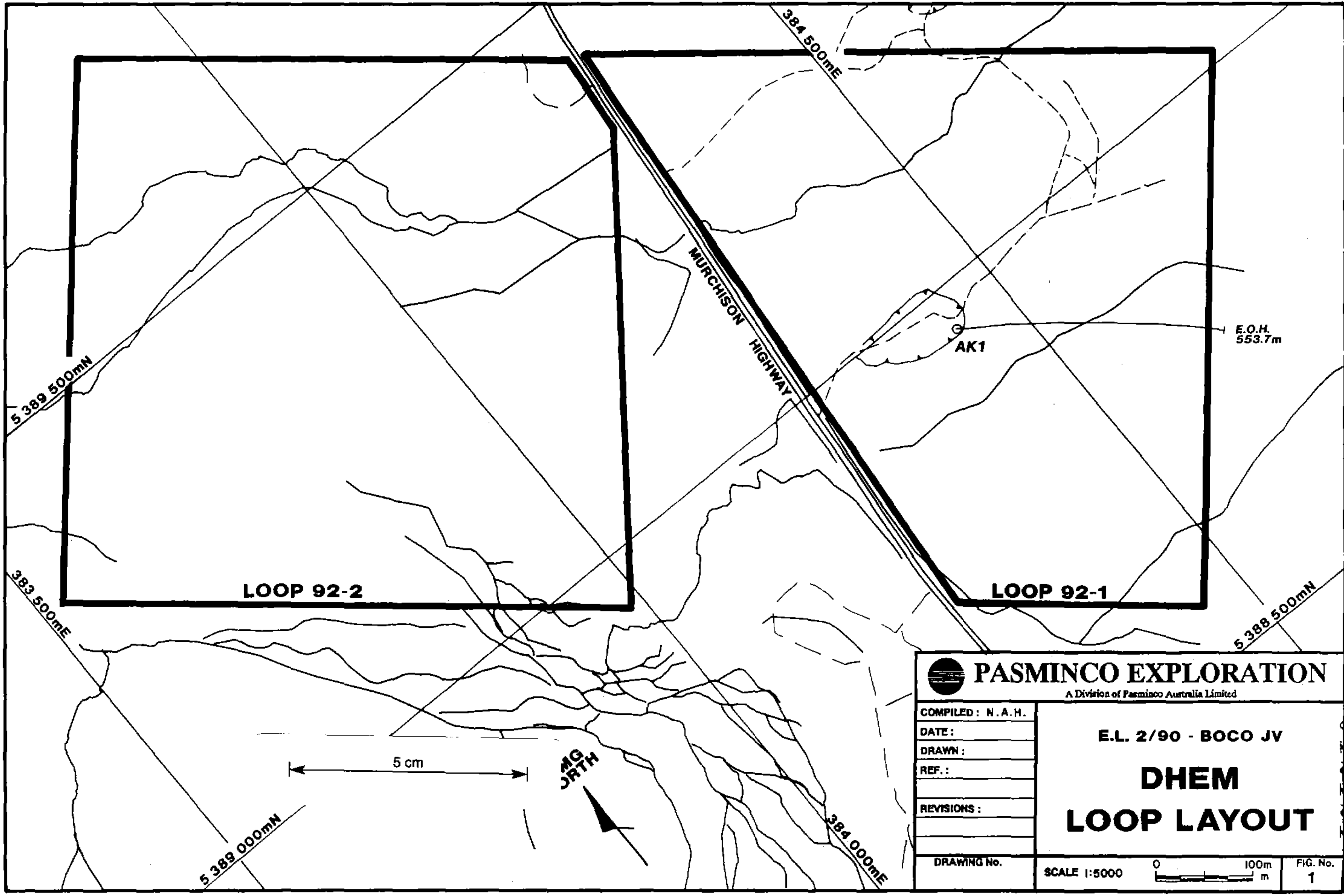
Boco, AK1

Drill-hole AK1 was initially logged with the UTEM system in September 1992. Unfortunately, the hole could not be logged below 280m due to a blockage, the cause of which is thought to be a pinch in the PVC lining. The hole was relogged to 535m in November 1992 using the Crone system, which uses a narrower probe than the UTEM system.

Two transmitter loops were used to excite the ground. The loop layouts are shown in Figure 1. The response profiles (Fig 2a–f) from both loops indicate current flow in the overburden. There are no off-hole anomalies detected At present there is no explanation for the flat negative responses on the UTEM profiles.

Neil Hughes

ajs:rap:93001


384 500mE
MURCHISON HIGHWAY
E.O.H.
553.7m
AK1
5 389 500mN
383 500mE
LOOP 92-2
LOOP 92-1
5 388 500mN
5 cm
5 389 000mN
384 000mE
PASMINCO EXPLORATION
A Division of Pasminco Australia Limited
COMPILED : N.A.H.
DATE :
DRAWN :
REF. :
REVISIONS :
DRAWING No.
E.L. 2/90 - BOCO JV
DHEM
LOOP LAYOUT
SCALE 1:5000
0
100m
m
FIG. No.
1

012121

CRONE GEOPHYSICS & EXPLORATION LTD
BOREHOLE PEM

Client	: PASMINCO EXPL	Hole	: AK-1
Grid	: ANIMAL CREEK	Tx Loop	: 92-1
Date	: Nov 20, 1992	File name	: AK1Z1.AM2

Data Scaled by Factor of 0.14 (converting nT/s2 to nV/amp m2)

Z COMPONENT dBz/dt nanovolt/amp m2

Scale: 1:2500 Unit Scale: 1cm = 100

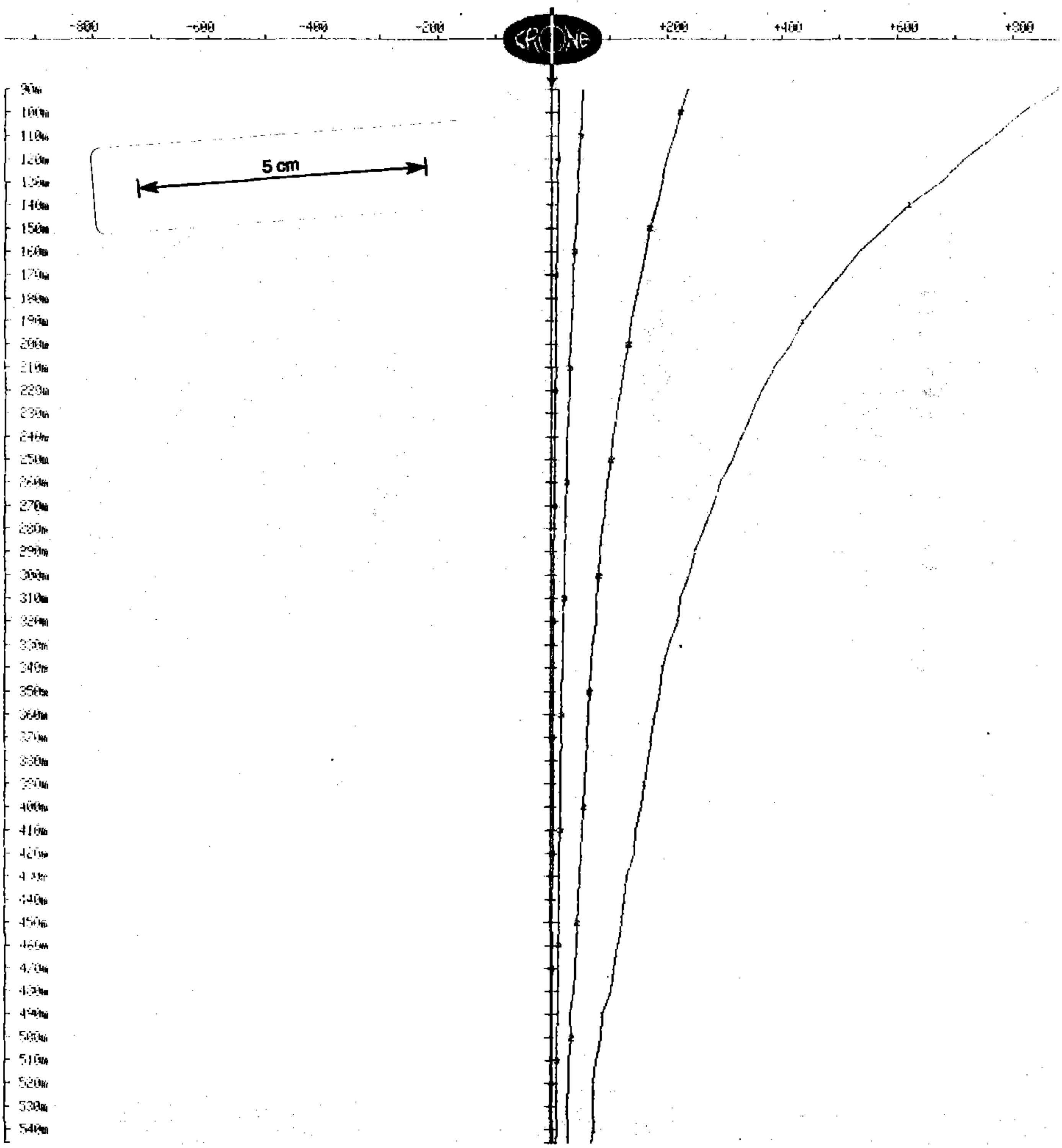


Figure 2a.

CRONE GEOPHYSICS & EXPLORATION LTD
BOREHOLE PEM

Client	: PASMINCO EXPL	Hole	: AK-1
Grid	: ANIMAL CREEK	Tx Loop	: 92-1
Date	: Nov 20, 1992	File name	: AK1Z1.AM2

Data Scaled by Factor of 0.14 (converting nT/s2 to nV/amp m2)
Z COMPONENT dBz/dt nanovolt/amp m2

Scale: 1:2500 Unit Scale: 1cm = 2

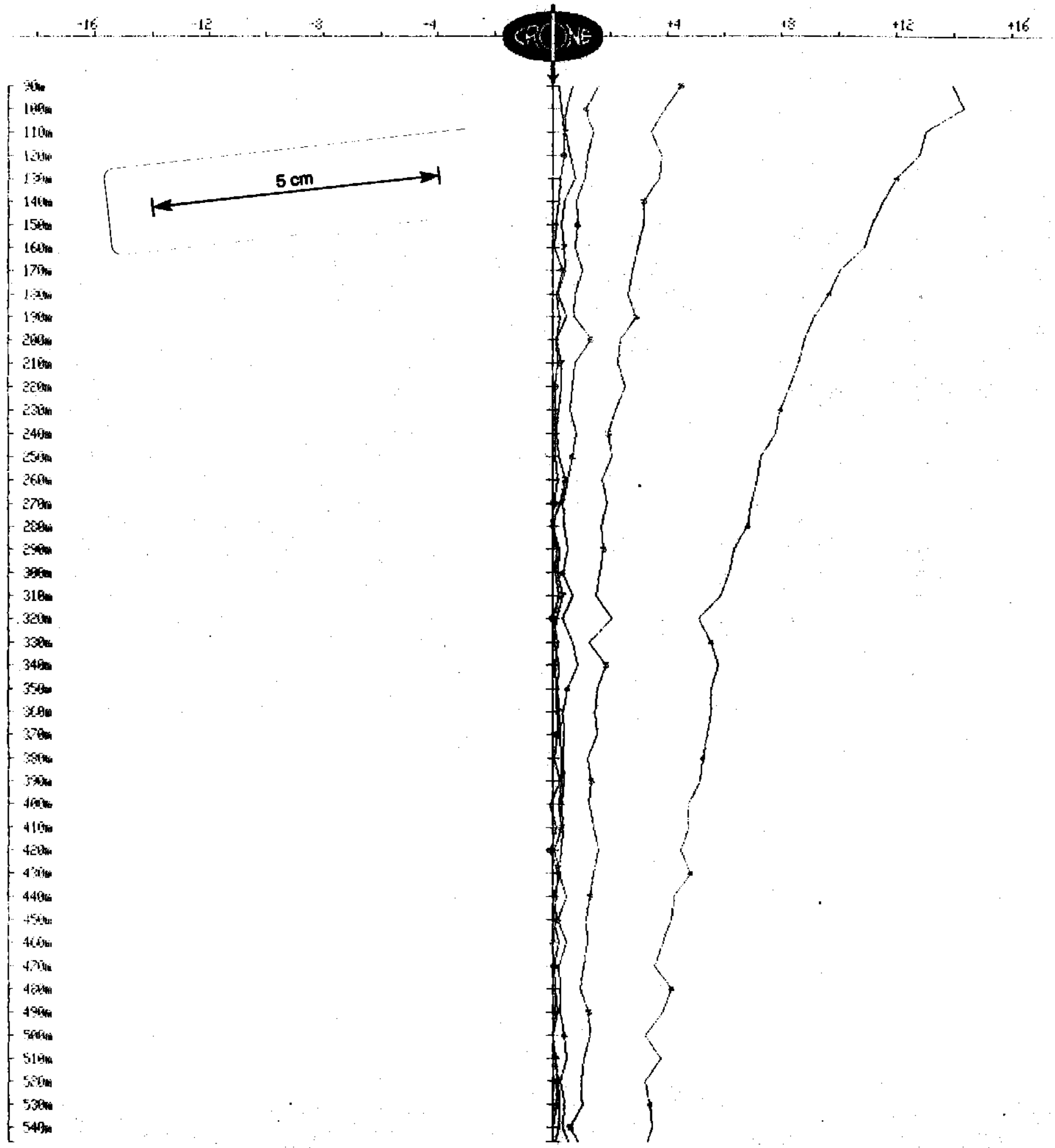


Figure 2 b

CRONE GEOPHYSICS & EXPLORATION LTD
BOREHOLE PEM

Client	: PASMINCO EXPL	Hole	: AK-1
Grid	: ANIMAL CREEK	Tx Loop	: 92-1
Date	: Nov 20, 1992	File name	: AK1Z1.AM2

Data Scaled by Factor of 0.14 (converting nT/s2 to nV/amp m2)
Z COMPONENT dBz/dt nanovolt/amp m2

Scale: 1:2500 Unit Scale: 1cm = 1000

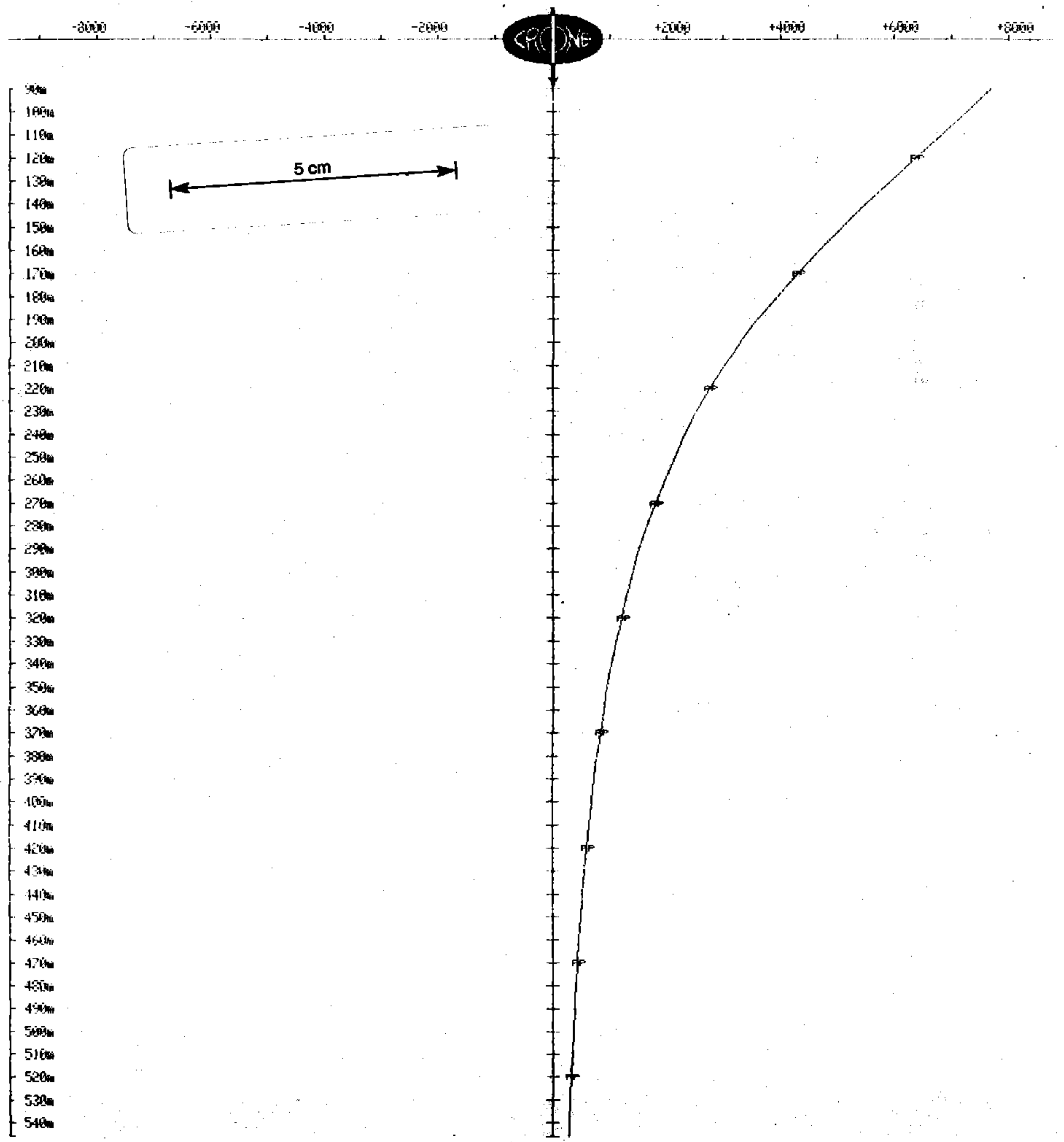


Figure 2c

CRONE GEOPHYSICS & EXPLORATION LTD
BOREHOLE PEM

Client	: PASMINCO EXPL	Hole	: AK-1
Grid	: ANIMAL CREEK	Tx Loop	: 92-2
Date	: Nov 20, 1992	File name	: ak1z2.am2

Data Scaled by Factor of 0.14 (converting nT/s2 to nV/amp m2)
Z COMPONENT dBz/dt nanovolt/amp m2

Scale: 1:2500 Unit Scale: 1cm = 20

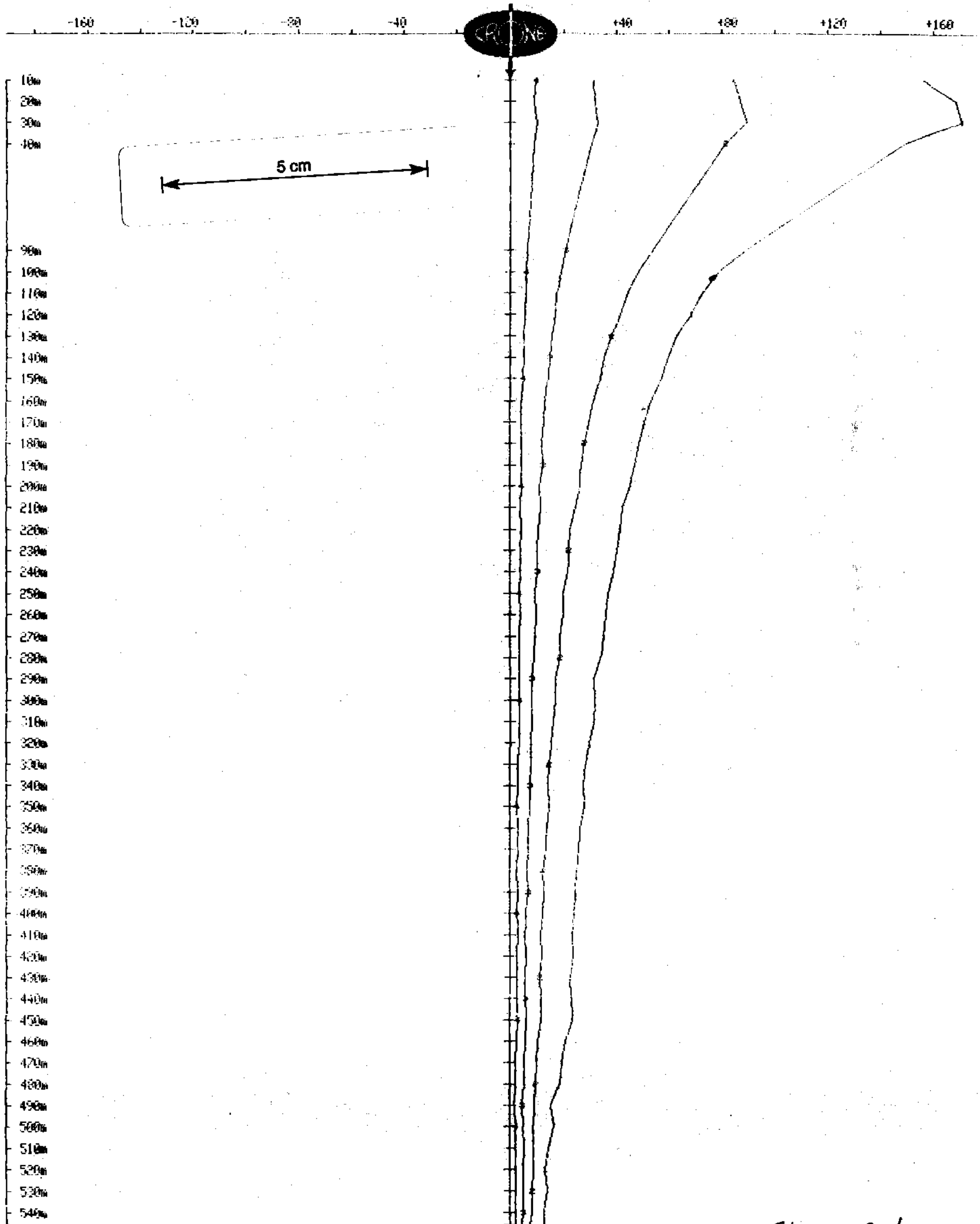


Figure 2d

CRONE GEOPHYSICS & EXPLORATION LTD

BOREHOLE PEM 012126

Client	: **PASMINCO EXPL**	Hole	: AK-1
Grid	: **ANIMAL CREEK**	Tx Loop	: 92-2
Date	: Nov 20, 1992	File name	: ak1z2.am2

Data Scaled by Factor of 0.14 (converting nT/s2 to nV/amp m2)
Z COMPONENT dBz/dt nanovolt/amp m2

Scale: 1:2500 Unit Scale: 1cm = 1

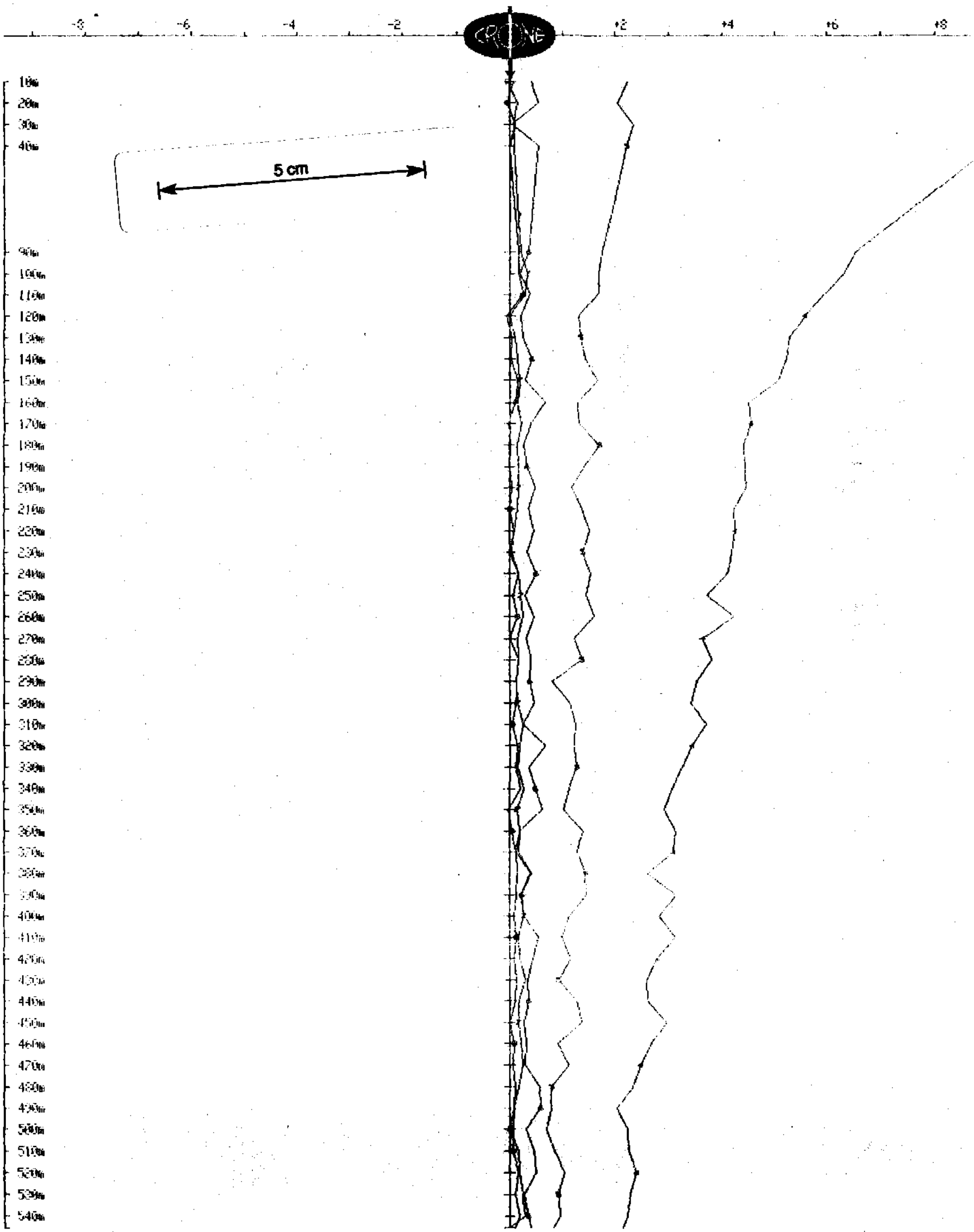


Figure 2e

CRONE GEOPHYSICS & EXPLORATION LTD

BOREHOLE PEM

012127

Client	: PASMINCO EXPL	Hole	: AK-1
Grid	: ANIMAL CREEK	Tx Loop	: 92-2
Date	: Nov 20, 1992	File name	: ak1z2.am2

Data Scaled by Factor of 0.14 (converting nT/s2 to nV/amp m2)

Z COMPONENT dBz/dt nanovolt/amp m2

Scale: 1:2500 Unit Scale: 1cm = 200

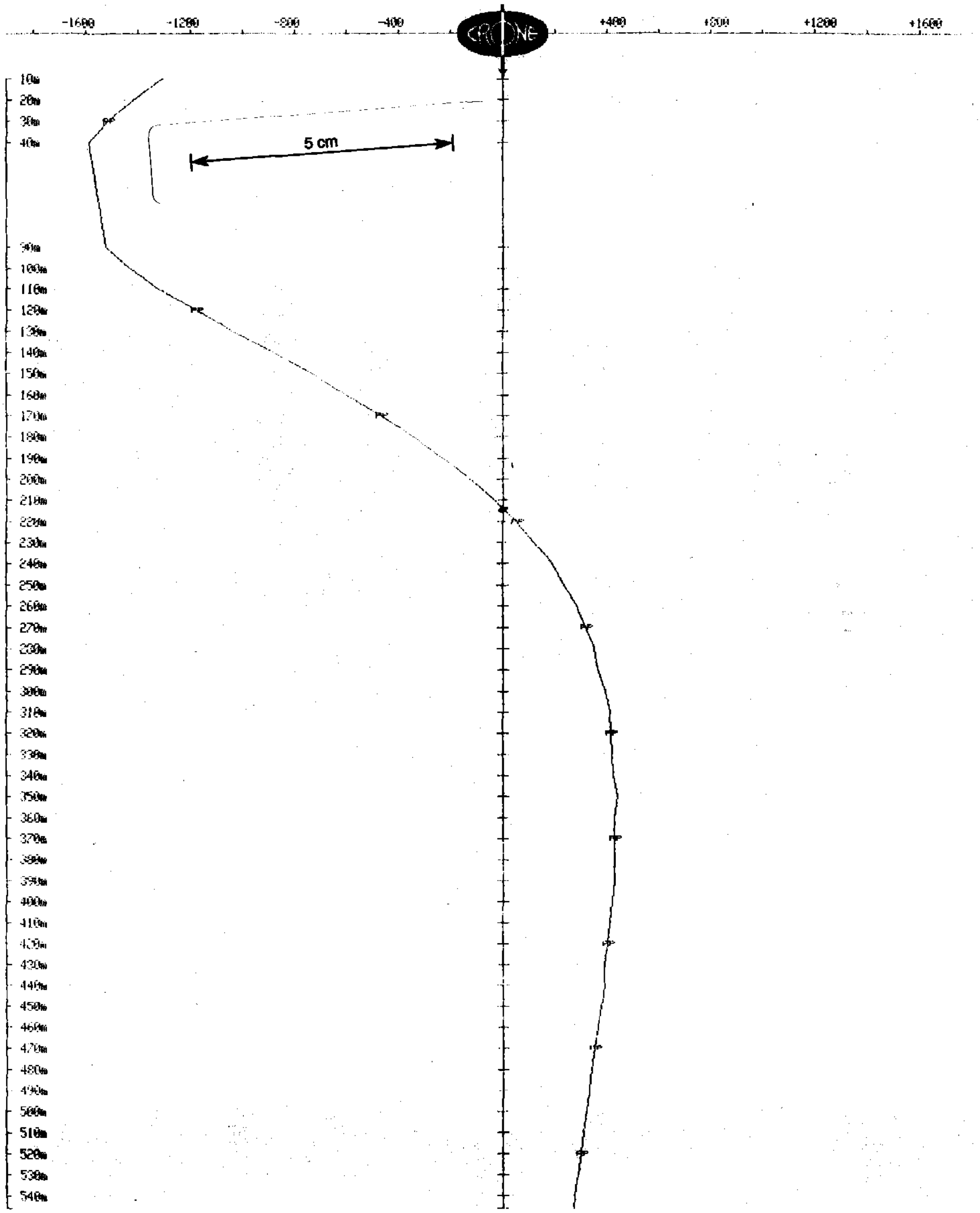


Figure 25

APPENDIX VI

PETROLOGY

012129

PETROGRAPHIC REPORT

PASMINCO QUE RV. EL 2/90

(Attn Roger Poltock, Fergus Fitzgerald)

Tony Crawford, 26/3/93

SAMPLE NUMBER: 34942

LOCATION: PASMINCO EL2/90

SUMMARY:

This is an unusual greywacke interpreted as a rather fine grained variant of Animal Creek Greywacke in which are set detrital, euhedral blocky plagioclase phenocrysts. It has suffered notable carbonate alteration.

HAND SPECIMEN:

This is a fairly fine-grained dark grey tuffaceous siltstone which contains common small clasts (<2mm) of dark felsic lava.

THIN SECTION:

This sample is unusual in that it is composed of around 15-20 modal% of blocky euhedral to slightly rounded plagioclase phenocrysts that are totally sericitized, set in a silty to fine sandstone matrix dominated by detrital angular quartz and muscovite. The plagioclase phenocrysts often occur in clots of several crystals, sometimes including fresh to slightly altered FeTi oxide microphenocrysts. Small angular clots of chlorite, and quite common big (to 4mm across) patches of calcite overprint the fine-grained matrix.

The unusual texture of this sample requires comment. Except for the presence of the large detrital plagioclase phenocrysts, this sample would be a standard, if not a slightly fine-grained, Animal Creek Greywacke, with the typical detrital muscovite and metamorphic angular quartz. Presumably, these plagioclase phenocrysts are from unconsolidated crystal lapilli tuffs that have been reworked into the greywacke during mass slumping.

SAMPLE NUMBER: 34902

LOCATION: PASMINCO Bulgobac EL2/90

SUMMARY:

This is a polymict coarse volcaniclastic sandstone that contains a dominant clast population derived from formerly glassy felsic plagioclase±quartz-phyric lavas (including som that show intense hydrothermal chlorite alteration), but also contains detritus from quartz-mica schists, and occasional ophiolitic chromites.

HAND SPECIMEN:

This is a coarse volcaniclastic with clasts of dark green fine-grained volcanics and reddish chert(?) to 1cm across.

THIN SECTION:

This sample is a coarse, poorly-sorted and matrix-supported volcaniclastic sandstone containing occasional clasts up to 1cm across, but the average grainsize is <1mm. The majority of clasts are meta-volcanics, and most of these were glassy to vitrophyric felsic lavas with albitized plagioclase phenocrysts varying in abundance from 0 to about 5-7 modal%. A notable number of these clasts, including several of the largest and presumably least-travelled, are very strongly chloritized, with the groundmass glass being entirely replaced by dull green chlorite. The intensity of this chlorite alteration demands an origin involving strong hydrothermal alteration, and resembles that developed in the stringer zones beneath VMS deposits. Less altered to almost unaltered clasts are also present, and have groundmasses composed of variably-textured quartzo-feldspathic intergrowths after former glass. Occasional trachytic-textured, almost holocrystalline but very fine-grained rocks are also present, and are probably from the interior portions of the same flows that yielded the glassy clasts.

Other detrital clasts in this rock are dominated by broken phenocrysts of albitized plagioclase <3mm long, that are slightly sericitized, and much less abundant broken quartz phenocrysts and altered FeTi oxide phenocrysts. Notable also are three or four small clasts of pelitic quartz-muscovite schist, and common detrital muscovite flakes to about 1mm long. Also significant are several small clasts of detrital reddish chromite, and two small grains of blue-green pleochroic tourmaline.

This is clearly a polymict volcaniclastic sandstone derived largely from felsic glassy plagioclase±quartz-phyric volcanics, including some that are strongly hydrothermally altered. However, the presence of chromite from the mafic-ultramafic complexes, and common detrital muscovite and quartz-mica meta-pelites, indicates that at least three sources were contributing detritus to this rock. It might be looked upon as an Animal Creek-type greywacke sand that has been reworked into a mass flow of felsic volcaniclastics.

SAMPLE NUMBER: **34904**

LOCATION: **PASMINCO Bulgobac EL2/90**

SUMMARY:

This is a

HAND SPECIMEN:

This is a .dark reddish strongly hematite-silica-altered rock

THIN SECTION:

This sample is composed of silica, hematite and a brownish chloritic mineral. There are no diagnostic traces of an original texture left, and the present texture is exceptionally heterogeneous and variable. There are two possible interpretations of this texture.

1: In many places, the texture reminded me of a serpentinized ultramafic rock (dunite) in which the serpentinized olivine had been almost entirely replaced by polygonal quartz, leaving bands and 'cells' of fine-grained magnetite, characteristic of serpentinization of olivine, set in dominant quartz and subordinate brownish chlorite or serpentine. The hematite-(magnetite)-rimmed, quartz-filled cells that look like former olivine crystals in a cumulate ultramafic, are often separated by meandering seams and veins of brownish chloritic material and or fibrous quartz.

An alternative interpretation is that this is a colloidal texture grown in silica-hematite from a siliceous gel or sinter. Seams of finer-grained silica may be due to localized recrystallization

SAMPLE NUMBER: 34915

LOCATION: PASMINCO EL2/90

SUMMARY:

This is a distinctive volcaniclastic sandstone derived fr plagioclase+augite-phyric andesites and basalts, presumably correlated with the Que Footwall Andesites. It also contains minor detrital component from felsic glassy lavas and rare pelitic metamorphic clasts.

HAND SPECIMEN:

This is a dark grey volcaniclastic sandstone with a maximum grainsize around 1mm..

THIN SECTION:

This sample is an even-textured, framework-supported volcaniclastic sandstone dominated by detrital phenocrysts and phenocryst fragments of plagioclase, augite, hornblende and FeTi oxides, and clasts of plagioclase-, and plagioclase+quartz-phyric felsic lava and finer-grained volcaniclastic sandstone and siltstone. Blocky, largely altered albitized plagioclase phenocrysts to about 2mm long maximum dominate the detrital grain population, and are replaced by pale chlorite, darker green pumpellyite and specks of sericite. Similar-sized often euhedral phenocrysts of augite are largely fresh, with rims and fractures replaced by pale green chlorite. These probably make up around 15 modal% of the rock. Much less abundant but still quite common, are phenocrysts of hornblende. These are pale brown and deep-greenish pleochroic and up to about 80modal% chloritized. Quartz phenocryst fragments are quite angular and up to 2mm long, and only make up around 2-4modal% of the rock. Former FeTi oxide phenocrysts up to 1mm long are strongly altered and disaggregated to leucoxene-chlorite.

The lava clasts are mainly formerly glassy dacites and rhyolites, with sparse phenocrysts of quartz and albite. These are up to about 3mm across, and only make up about 2modal% of the rock. There are perhaps 3-4 modal% of totally chloritized lithic clasts, but there are no phenocrysts in these and it is not possible to tell whether they were chloritized felsic glass or serpentinous material. Significant are several small but distinct clasts of quartz-mica schist, and a larger clast of volcanogenic sandstone in which many of the clastic grains are epidote-altered. The limited matrix of this sample was probably clayey to silty, and has recrystallized to a very fine-grained, almost isotropic messy material.

This is a distinctive sandstone derived dominantly from andesitic volcanics, presumably of the Que Footwall-type andesites , with a minor input from felsic lavas and pelitic metamorphics. Presumably it post-dates the Animal Creek Greywacke and correlates, and would be either interbedded in, or post-date the Que Footwall Andesite horizon.

SAMPLE NUMBER: 34922
LOCATION: PASMINCO EL2/90
SUMMARY:

This is a coarse-grained greywacke derived dominantly fr fine-grained, sometimes carbonate-bearing metasediments, some pelitic metamorphics, detrital metamorphic or reef quartz, and serpentine and chromite from the mafic-ultramaf complexes. It contains apparently no material from the Moun Read Volcanics.

HAND SPECIMEN:

This is a .dark red-grey volcaniclastic sandstone with clasts of very fine-grained lava or tuff and chert to almost 1cm across.

THIN SECTION:

This sample is a totally framework-supported, poorly-sorted sandstone with clasts up to 1cm long, but the average grainsize is probably closer to 0.5mm. A large variety of lithic clasts are present, and most are sedimentary, although there are a few metavolcanic clasts. The latter are themselves variable, and include a large black clast of quenched aphyric andesite or basalt dominated by tiny sheaves of acicular albite microlites in devitrified glass charged with hematite dust. Other volcanic clasts include a few strongly chloritic rocks that have textures suggestive of derivation from the ophiolite (mafic-ultramafic complex) rather than the Mount Read Volcanics. Most lithic clasts, however, are composed of sandstones and siltstones with abundant angular, detrital quartz and albite. Finer-grained, often almost opaque sedimentary clasts are abundant and include cherty material, and siltstones or shales in which common calcite rhombs probably reflect an originally carbonate-rich sediment. At least three clasts unambiguously derived from the ophiolites are obvious. Two of these are flattened and smeared out serpentine clasts hosting several large euhedral red chromites. The third is a coarse-grained anorthosite, such as are represented in the upper parts of the ophiolitic magma chambers. Many smaller chlorite/serpentine clasts are probably similarly derived.

The other major detrital component in this greywacke is the abundant (~30 modal%) angular quartz grains. These average around 0.5mm across, show complex internal strain features, are sometimes polycrystalline, and are clearly not of volcanic origin. Detrital muscovite is not uncommon, and several small quartz-mica schist lithic clasts are clearly of metamorphic derivation. Despite a careful search, there is no compelling evidence that there is any component in this rock derived from the Mount Read Volcanics; if there is, it is subordinate and modally insignificant.

This rock is a coarse greywacke containing recycled metasediments and pelitic metamorphics, and less abundant material from the mafic ultramafic complexes. It is not typically Animal Creek Greywacke, although that would be the unit in the Mount Read Volcanic region that is petrographically most similar to this rock.

SAMPLE NUMBER: 34932

LOCATION: PASMINCO EL2/90

SUMMARY:

This is a volcaniclastic greywacke derived from felsic plagioclase-phyric lavas and tuffs, and minor silty volcaniclastics. It has suffered pervasive chlorite+epidote alteration of the matrix. It is probably a Southwell Subgroup Dundas Group correlate.

HAND SPECIMEN:

This is a mottled greenish-cream, quite altered, medium-grained volcaniclastic greywacke.

THIN SECTION:

This sample is an almost framework-supported greywacke composed largely of detrital albitized plagioclase phenocrysts, and fine-grained tuffaceous siltstone clasts in a chloritized matrix. The detrital plagioclase phenocrysts are mainly entire, and are up to 3mm long. They are free of sericite, though occasional crystals contain granular epidote inclusions. Occasional quartz phenocryst fragments are present, and a few lithic clasts were clearly formerly glassy lavas with sparse phenocrysts of albite and/or quartz. Former FeTi oxide phenocrysts are altered to leucoxenitic material, and are relatively abundant. The lithic clasts are not nearly as abundant as the detrital albite, and are mainly fine-grained siliceous, probably recrystallized cherty material and some definite fine-grained greywackes.

The matrix of this sample originally probably made up 20-30 modal% of the rock, and has virtually entirely altered to chlorite, which contains common epidote and secondary silica.

This sample is a greywacke derived from felsic volcanics and tuffaceous volcaniclastics. It has suffered moderate but pervasive hydrothermal alteration, producing extensive chlorite from the matrix. It is probably bast correlated with Dundas-Southwell Subgroup volcaniclastics.

SAMPLE NUMBER: 34933

LOCATION: PASMINCO EL2/90

SUMMARY:

This is a coarse-grained volcaniclastic sandstone compos of angular clasts of felsic quartz+plagioclase-phyric former glassy lavas set in a fine, sandy matrix composed of detrital metamorphic quartz and muscovite.

HAND SPECIMEN:

This is a quite coarse-grained volcaniclastic sandstone dominated by clasts of brown and red felsic fine-grained lava and cherty material averaging around 5mm across.

THIN SECTION:

This sample is a matrix-poor, fairly poorly-sorted volcaniclastic coarse sandstone dominated by angular lithic clasts composed of a great variety of rhyolitic and dacitic formerly glassy lavas mainly around 4-8mm long. Matrix probably makes up around 10-15 modal% of this sample. The lithic clasts vary from aphyric-, to moderately plagioclase+quartz-phyric, and all have groundmasses composed of very fine-grained quartzo-feldspathic intergrowths after glass. A few clasts of quartz-muscovite schist are present, and at least two very recrystallized, hydrothermally-altered silica-rich clasts are present.

The matrix of this sample is a fine-grained sandstone composed of angular polycrystalline detrital metamorphic quartz and well-formed plates of detrital muscovite, with common interstitial chlorite, and is petrographically identical to the typical Animal Creek Greywacke. This is a coarse-grained volcaniclastic greywacke petrographically very similar to 34902, with similar stratigraphic implications.

SAMPLE NUMBER: 34944

LOCATION: PASMINCO EL2/90

SUMMARY:

This is another mixed provenance greywacke, with detrit: components from pelitic metamorphics, quartz-phyric felsic lavas, and possibly some carbonated serpentine clasts from t ophiolitic rocks.

HAND SPECIMEN:

This is a coarse, quartz-rich greywacke with visible grai of quartz, lithic clasts and a dark, altered matrix.

THIN SECTION:

This is a poorly-sorted, almost framework-supported quartz-rich greywacke. The clasts vary in size from about 4mm maximum down to silt, and are dominantly angular quartz, and quartzite lithic clasts. The quartz clasts include both metamorphic quartz, commonly polycrystalline, with strained extinction, and bands of subgrain recrystallization, and more abundant and generally larger quartz phenocrysts. The latter are also commonly strained and sometimes show subgrain recrystallization, but they also often preserve crystal faces and recrystallized rounded melt inclusions. The lithic clasts show a large range in mineralogy and texture, reflecting their varied origins. Most abundant are thoroughly recrystallized, formerly glassy felsic lavas in which mosaic quartzo-feldspathic textures predominate, but are also variably recrystallized due to deformation. These felsic lava clasts occasionally contain small quartz phenocrysts and are often quite strongly sericitized. Other common lithic clasts include abundant quartzites, with strongly foliated quartz and no other mineral, and a number of quartz-muscovite schists. There are also quite a few small, less obvious lithic clasts composed of dull chlorite or serpentinite(?), that are strongly overprinted by calcite.

The matrix of this sample is all but eliminated by pressure solution, with strong stylolites marked by concentrations of insoluble opaque oxides or carbonaceous material being quite common. Minor components of the matrix are small detrital muscovite laths, and silty material that is highly sericite-altered, and commonly partially overprinted by calcite. A few small spots of brown sphalerite are present in the matrix.

This quartz-rich greywacke has a mixed pelitic metamorphic, and felsic volcanics provenance. The abundance of volcanic quartz and felsic lava clasts makes this greywacke petrographically unlike typical Animal Creek Greywacke. The probable presence of altered serpentinitic material could be checked by a Cr assay.

SAMPLE NUMBER: 34948

LOCATION: PASMINCO EL2/90

SUMMARY:

This is a polymict greywacke, with clasts from pelitic metamorphic, ophiolitic, and possibly Success Creek Group hematitic siltstones and carbonates. It is probably best correlated with the Animal Creek Greywackes.

HAND SPECIMEN:

This is a dark grey, fine-grained, unbedded, micaceous greywacke.

THIN SECTION:

This sample in thin section shows bedding, in the form of minor but obvious variations of grainsize, although the clast composition of the various poorly-defined beds is essentially identical. This rock is a moderately well-sorted, framework-supported, almost matrix-free greywacke. It is marked by a remarkable diversity of lithic and mineral clasts, indicating at least three or four sources. Probably the most abundant grains are particularly angular quartz fragments, up to a maximum of 1mm across. These show features indicating derivation from pelitic metamorphics, and are sometimes intergrown with Kspar. There are few grains if any that I can confidently say were phenocrysts in felsic volcanics. Among the detrital grains are plentiful, well-formed biotite and muscovite crystals. These may be derived from coarse-grained pelitic metamorphics (gneisses) but it cannot be ruled out that are, in fact, derived from granitoids. It is significant in this respect that there is common angular detrital Kspar, some grains showing microcline twinning, that I have not seen in similar rocks from W Tasmania.

There is a great diversity of lithic clasts, including the following in approximate order of decreasing abundance:
(1) fine-grained siltstones and mudstones, often quite reddish and hematitic, (2) coarser-grained pelitic metamotphics, including quartz-muscovite schists and quartz-Kspar-mica gneisses, (3) chloritic, quench-textured and formerly glassy lavas, many of which are very similar to the low-Ti basalts in the ophiolites such as Heazlewood River Complex, (4) serpentine-chlorite clasts, occasionally with textures suggesting derivation from pyroxenites, and again suggesting derivation from the ophiolites, and (5) not uncommon reddish carbonate lithic clasts.

The source of the schists and gneisses, and the detrital quartz, micas and Kspar is presumably the Precambrian Tyennan core of Tasmania, but the common hematitic siltstones and reddish carbonates strongly resemble lithologies in the Success Creek Group and at the base of the Smithton Trough sequence. The ophiolites have clearly contributed significantly to this rock, and I see no lithic clasts unambiguously derived from the Mount Read Volcanics. This is probably a more 'mafic' version of the Animal Creek Greywackes.

from Appendix D2
EL 11/85 Yolande Annual Rept July 91

012139

SAMPLE No: 31624 Lynchford

SUMMARY: This is a coarse-grained volcaniclastic sediment composed of crystal and rock fragment detritus from two major sources, a quartz+feldspar-phyric felsic lava pile, and an augite+plagioclase+FeTi oxide-phyric andesite sequence.

HAND SPECIMEN:

This is a quite coarse-grained volcanogenic sediment with clasts of dominantly felsic volcanics up to several cm long.

THIN SECTION:

This sample is a volcanogenic sediment derived principally from two sources. Clasts (and discrete detrital crystals of quartz and feldspar) of originally glassy almost aphyric to relatively strongly quartz+ feldspar-porphyritic rhyolite are dominant make up about 40 modal% of the rock, and vary from several cm long to fine sand-sized. Feldspar occurs as blocky crystals to several mm across, is albitized plagioclase and generally shows only minor sericite speckling. One of the largest clasts in the sample is a formerly glassy almost aphyric rhyolite that has been totally replaced, except at its outermost margins, by fine-grained calcite.

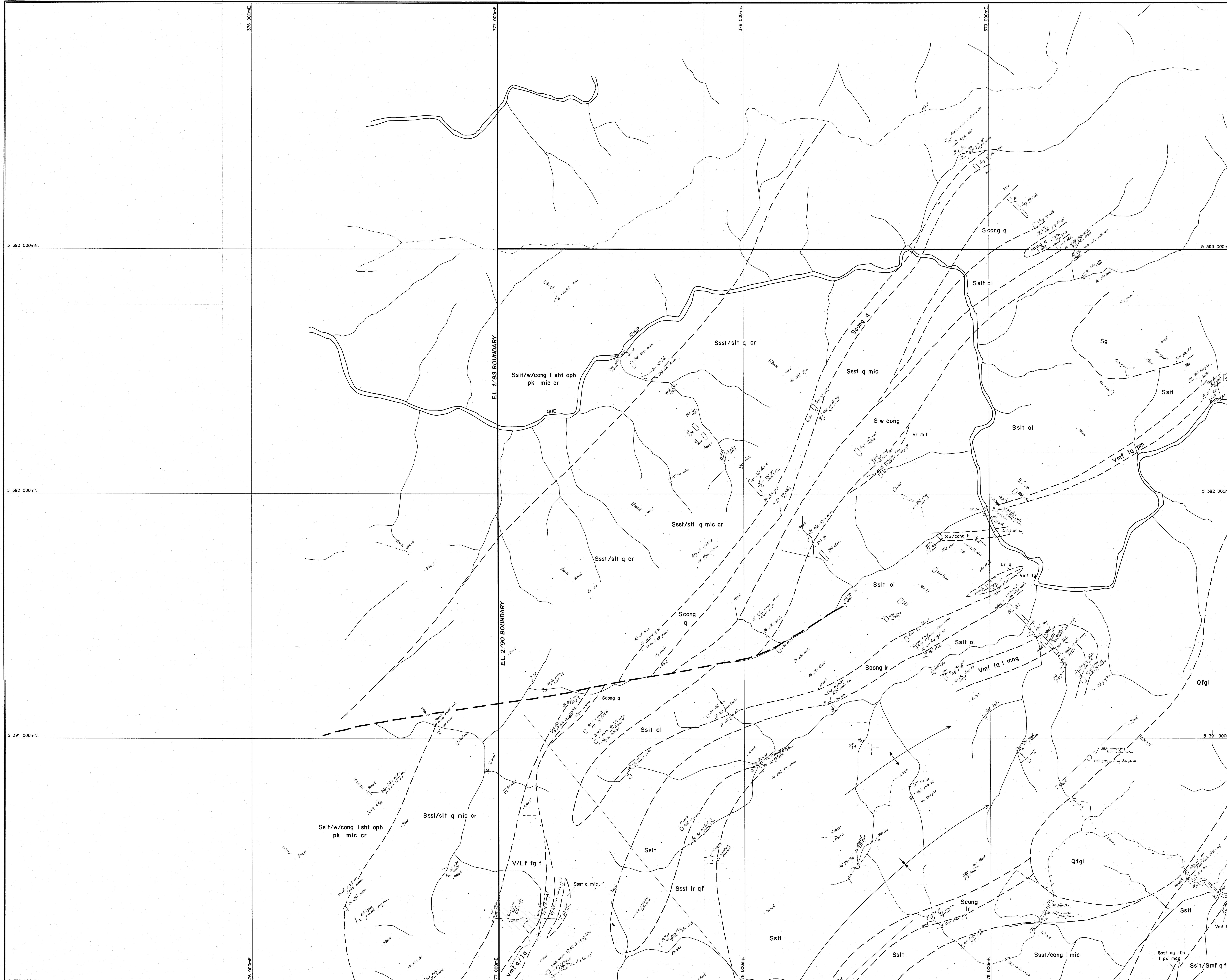
Equally as abundant as the felsic detritus is crystal fragment material and some rock clasts derived from an andesitic to basaltic source. Prominent in this assemblage are beautiful well-formed phenocrysts and phenocryst fragments of fresh augite, that shows marginal replacement by fibrous pale green actinolite. The augite phenocrysts average from 1-2mm long, and have the appearance of typical augite phenocrysts in Mount Read Volcanics andesites and basalts such as the Hellyer and Lynchford basalts. The presence of microphenocrystal inclusions of FeTi oxide in many augite crystals argues for evolved basalt or andesite lava sources for these crystals. In fact, one well-preserved volcanic fragment is clearly andesitic rather than basaltic, with phenocrysts of augite, plagioclase and FeTi oxide. Detrital well-formed FeTi oxide phenocrysts are also common in this rock, and argue for an andesitic source.

The groundmass of this sample is a variable silty to fine-sand-sized material that was probably rich in glassy ash; the glass has devitrified and recrystallized to very fine-grained quartz-feldspar - minor chlorite intergrowths. It contains common acicular actinolite.

This sample is derived from a source dominated by two components, a felsic quartz+feldspar-phyric lava suite and a plagioclase + augite+FeTi-oxide phyric andesite suite. The presence of common actinolite in this rock indicates that it is a low greenschist facies burial metamorphic assemblage, and higher grade than the Henty Fault Wedge rocks described in this set of samples.

FIGURES


5 395 000mN
375 000mE
380 000mE
385 000mE
390 000mE
5 390 000mN
5 385 000mN
5 380 000mN
5 375 000mN
E.L. 37/89
E.L. 2/90
E.L. 1/93
E.L. 8/90
E.L. 44/88
E.L. 12/88
Tg
Qg
€wa
€ss
€sq
€lt
€ws
€q
€pr
SILVER FALLS
ROSEBERY FAULT
Hatfield
Huskisson R
Coldstream R
Ross
John
Lynch Ck
Que
Bulgobac
Animal
Surprise Ck
River
Sock Creek
Mt. Charter
MOUNT CHARTER
BULGOBAC HILL
MT. BLOCK
MURCHISON
HIGHWAY
Road
RAILWAY
BAY
Boco
Creek
Sawmill
Higgins
Leo's Find
Brown's
Thomas'
BURNS PEAK
Pinnacles
Rivulet
Hollway
Emu
HEC
Transmission
Tramway
Farm
Lines
Tullabardine
Tullabardine Dam
Chester Dam
Chester
MOUNT KERSHAW
Marionoak
Pieman
LAKE
ROSEBERY
Langdons
Bastyan Dam
Cutty Sark
MT. SALE
MINE LEASE EXTENSION
ROSEBERY MINE LEASE
Hawkesbury
Bobadil Dam
Bobadil Ck
Slip Ck
Chasm Ck
LAKE PIEMAN
MT. BLACK
Mackintosh
North Mackintosh
NEW NORTH MT. FARRELL
Central Mackintosh
South Mackintosh
NORTH MT. FARRELL
Mt. Farrell
South Mt. Farrell
Dutton's Show
Central Farrell
Central Ck
Murchison Extended
Murchison River Mine
North Murchison
South Murchison
Lakeside
Thomas Blocks
LEGEND
QUATERNARY
Qg Fluvioglacials
TERTIARY
Tg Gravels
CAMBRIAN
€ss SOUTHWELL SUBGROUP ?
Siltstone, sandstone, conglomerate and minor felsic volcanics
Provenance metamorphics, chlorite hematite altered felsic volcanics and ophiolites.
€lt LYNCHFORD TUFF
Volcaniclastic sandstone.
Provenance mafic – intermediate volcanics, pelitic metamorphics and ophiolite.
Detrital magnetite.
€ws WHITE SPUR FORMATION
Grey–dark grey siltstones with mass debris flow graded units, from quartz feldspar crystal lithic – vitric siltstone.
Provenance felsic volcanics.
€q Quartz crystal sandstone – quartz feldspar phyric lava/intrusive
€pr PINNACLES RHYOLITE
Feldspar > quartz phyric rhyolite lava/breccia
€sq STITT QUARTZITE
Quartz muscovite sandstone, siltstone and quartzose conglomerate.
Provenance, meta sediments, felsic volcanics and ophiolite.
Detrital minerals – chromite
Mineralization localized trace of galena/sphalerite on joint faces and disseminated.
€wa WESTCOTT ARGILLITE
Siltstone–greywacke–conglomerate pink brown carbonate rich matrix.
Provenance metamorphics (schist gneiss) ophiolite and Success Creek Group hematitic siltstone.
Geological boundary
Fault
Dip
Fold axis
Magnetic trend
012141
5 cm
93-3439.
PASMINCO EXPLORATION
A Division of Pasminco Australia Limited
COMPILED: R.A.P.
DATE: April, 1993
DRAWN BY: G.M.B.
REF.:
REVISIONS:
DRAWING No.
E.L. 2/90 - BOCO JV
E.L. 8/90 - NORTH PINNACLES JV
INTERPRETIVE GEOLOGY
SCALE 1:25,000
METRES
FIG. No. 5



LEGEND

1. General Form

Colour, grain size, overall texture, Rock Type, constituents & textutres, alteration, mineralisation.

Descriptors and Rock Types to be separated by comma or slash. Derwent series 19 colours (in brackets) are intended for the Cambrian sequences.

2. Rock Types

Lavas L

- a (9) acid
- i (46) intermediate
- b (49) basaltic
- r (9) rhyolitic
- d (11) dacitic
- n (46) andesitic

Intrusives I

- a (12) acid
- i (46) intermediate
- b (49) basic
- fel felsic
- p porphyritic
- g (12) granitic
- peg pegmatitic

Volcaniclastics V

- pm (7) pumiceous mass flow
- q (32) quartz phyric mass flow
- sst (32) sandstone
- mf (32) graded crystal lithic

Sediments S

- sh (35) shale
- t (36) slate incl. black slate
- slt (35) siltstone
- sst (39) sandstone
- tb turbidite
- w (39) wacke
- cong (39) conglomerate
- Δ breccia
- cht (34) chert
- lst (65) limestone
- dol (65) dolomite
- q (39) quartzite
- Fe iron formation
- gl (4) glacial deposits
- fgl (4) fluvioglacial deposits
- alv (4) alluvial deposits
- mst (35) mudstone

Metamorphic Rocks M
Colours should be hatched

- sht (38) schist
- sp (35) semi-pelite
- ps (39) psammite
- amph amphibolite
- gran granulite
- sk skarn
- mb (65) marble
- m mylonite

3. Descriptors

Colour:

- ple pale
- dk dark
- clr clear
- or orange
- blk black
- pk pink
- rd red
- brn brown
- bl blue
- wht white
- yel yellow
- ol olive
- grn green
- ppl purple
- crm cream

Grainsize:

- fg fine grained
- mg medium grained
- cg coarse grained
- vcg very coarse grained

Overall Texture:

- aug augen
- p porphyritic
- fol foliated
- clvd cleaved
- msv massive
- blk blocky
- bd bedded
- lam laminated
- xbd cross bedded
- xlam cross laminated
- br brecciated
- fb flow banded
- fΔ flow brecciated
- ufs upwards fining sequence
- hyl hyaloclastic
- pill pillowed
- pep peperitic

Constituents & Internal Textures:

- f feldspar
- q quartz
- l lithic
- pm pumice
- styl stylolites
- wsp wisps
- ves vesicles
- sph spherulites
- lph lithophysae
- mic micaceous
- mag magnetite
- cr chromite
- px pyroxene
- hb horneblende
- op ophiolite

Alteration:

- alb albitised
- co carbonate alt
- chl chloritised
- ser sericited
- kao kaolinised
- ep epidotised
- sil silicified

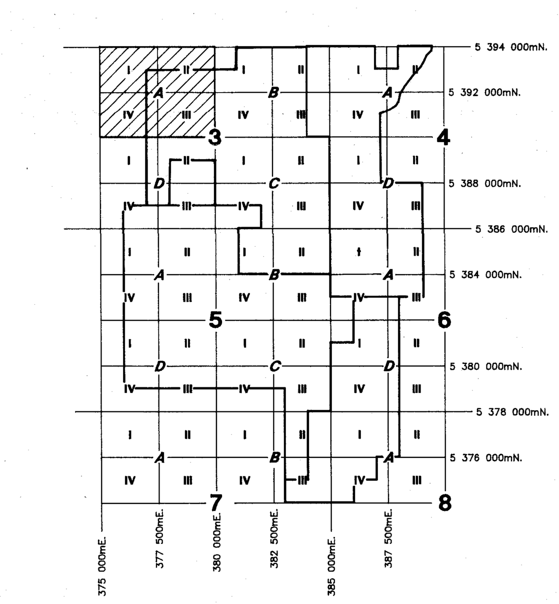
Mineralisation:

- diss disseminated
- str stringer
- msv massive
- gos gossan
- bx boxwork
- py pyrite
- po pyrrhotite
- asp arsenopyrite
- gn galena
- sp sphalerite
- mag magnetite
- hm haematite

3. Mapping Symbols

Unassigned ? Use alone or as a qualifier to other rock types where uncertain.

- Strike and Dip of Strata
- Strike and dip of inverted strata
- Strike and dip of cleavage or foliation
- Plunge of lineation
- Geological boundary position accurate
- Geological boundary position approximate
- Mine
- Abandoned prospect or mine
- Costean or trench
- Diamond drill hole, including projection
- I.P. Anomaly
- Unconformity
- Fault
- Thrust Fault
- Plunging antiform
- Plunging synform
- Shear/strong cleavage
- Sil + Ser + Py Alteration Zone
- Magnetic/Gravity/TM Lineaments
- Magnetic Trend Line



5 cm

012142

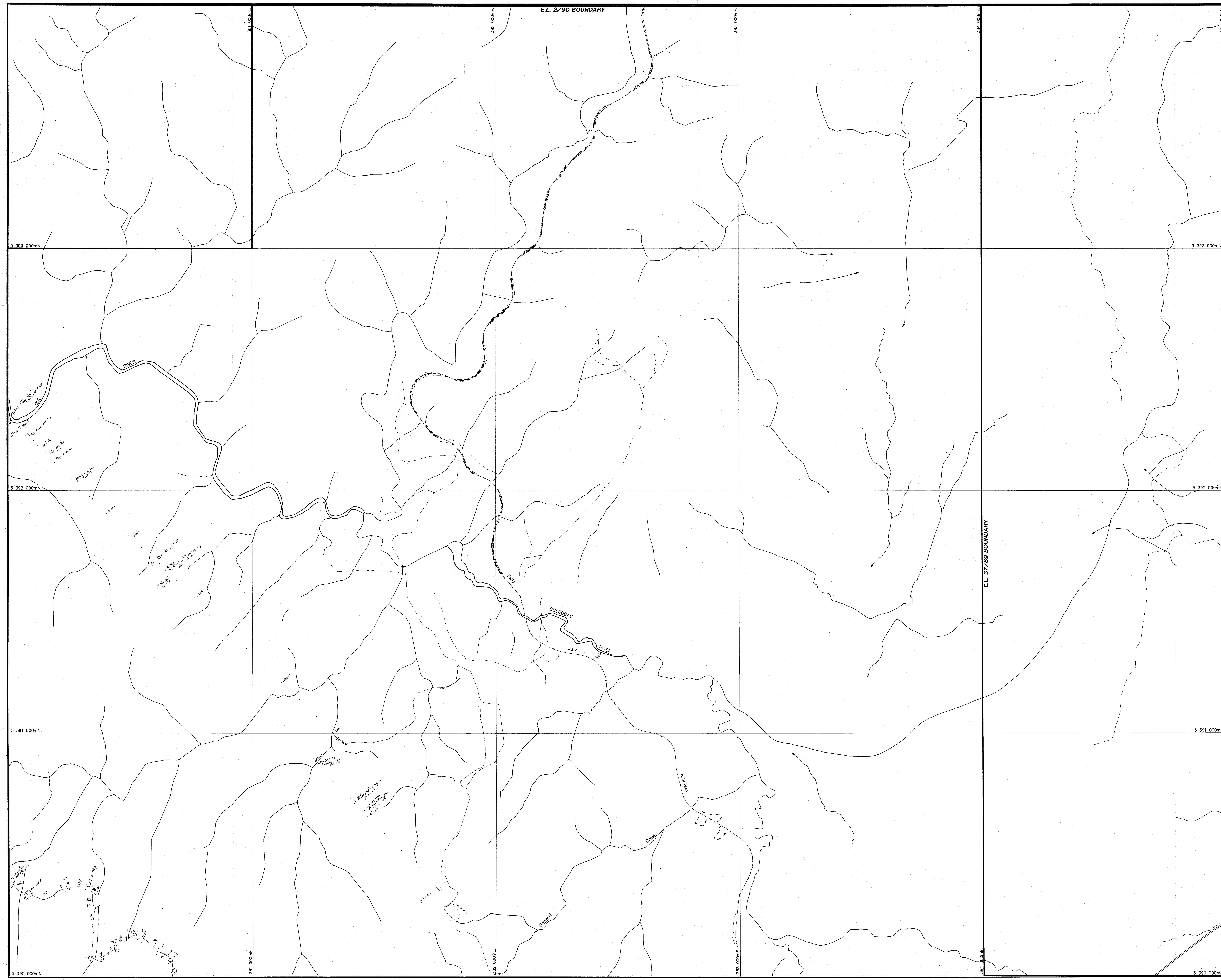
GRID CONVERGENCE 1.0°
GRID/MAGNETIC 12.0°
TN MN

93-3439.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : R.A.P.	E.L. 2/90 - BOCO JV
DATE : April, 1993	**OUTCROP GEOLOGY, INTERPRETIVE GEOLOGY AND ROCK SAMPLE LOCATIONS**
DRAWN : G.M.B.	
REFERENCE :	
REVISIONS :	
DRAWING No. SHEET 3A	SCALE 1:5000 (0 100 200 METRES) — FIG. No. 6

17



LEGEND

1. General Form

Colour, grain size, overall texture, Rock Type, constituents & textutres, alteration, mineralisation.

Descriptors and Rock Types to be separated by comma or slash. Derwent series 19 colours (in brackets) are intended for the Cambrian sequences.

2. Rock Types

Lavas L

a	(9)	acid
i	(46)	intermediate
b	(49)	basaltic
r	(9)	rhyolitic
d	(11)	dacitic
n	(46)	andesitic

Intrusives I

a	(12)	acid
i	(46)	intermediate
b	(49)	basic
fel		felsic
p		porphyritic
g	(12)	granitic
peg		pegmatitic

Volcaniclastics V

pm	(7)	pumiceous mass flow
q	(32)	quartz phyric mass flow
sst	(32)	sandstone
mf	(32)	graded crystal lithic

Sediments S

sh	(35)	shale
t	(36)	slate incl. black slate
slt	(35)	siltstone
sst	(39)	sandstone
tb		turbidite
w	(39)	wacke
cong	(39)	conglomerate
Δ		breccia
cht	(34)	chert
lst	(65)	limestone
dol	(65)	dolomite
q	(39)	quartzite
Fe		iron formation
gl	(4)	glacial deposits
fgl	(4)	fluvioglacial deposits
alv	(4)	alluvial deposits
mst	(35)	mudstone

Metamorphic Rocks M
Colours should be hatched

sht	(38)	schist
sp	(35)	semi-pelite
ps	(39)	psammite
amph		amphibolite
gran		granulite
sk		skarn
mb	(65)	marble
m		mylonite

3. Descriptors

Colour:

ple pale
dk dark
clr clear
or orange
blk black
pk pink
rd red
brn brown
bl blue
wht white
yel yellow
ol olive
grn green
ppl purple
crm cream

Grainsize:

fg fine grained
mg medium grained
cg coarse grained
vcg very coarse grained

Overall Texture:

aug augen
p porphyritic
fol foliated
clvd cleaved
msv massive
blk blocky
bd bedded
lam laminated
xbd cross bedded
xlam cross laminated
br brecciated
fb flow banded
fΔ flow brecciated
ufs upwards fining sequence
hyl hyaloclastic
pill pillowed
pep peperitic

Constituents & Internal Textures:

f feldspar
q quartz
l lithic
pm pumice
styl stylolites
wsp wisps
ves vesicles
sph spherulites
lph lithophysae
mic micaceous
mag magnetite
cr chromite
px pyroxene
hb horneblende
op ophiolite

Alteration:

alb albitised
co carbonate alt
chl chloritised
ser sericited
kao kaolinised
ep epidotised
sil silicified

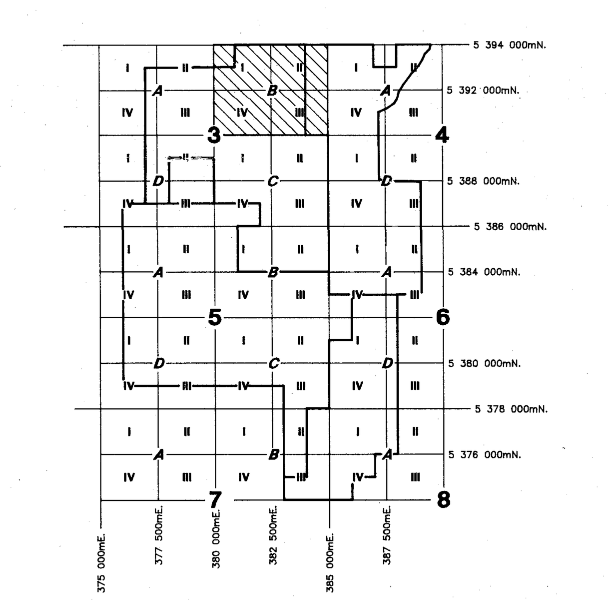
Mineralisation:

diss disseminated
str stringer
msv massive
gos gossan
bx boxwork
py pyrite
po pyrrhotite
asp arsenopyrite
gn galena
sp sphalerite
mag magnetite
hm haematite

3. Mapping Symbols

Unassigned ? Use alone or as a qualifier to other rock types where uncertain.

25 Strike and Dip of Strata
Strike and dip of inverted strata
60 Strike and dip of cleavage or foliation
50 Plunge of lineation
Geological boundary position accurate
Geological boundary position approximate
Mine
Abandoned prospect or mine
Costean or trench
Diamond drill hole, including projection
I.P. Anomaly
Unconformity
Fault
Thrust Fault
Plunging antiform
Plunging synform
Shear/strong cleavage
Sil + Ser + Py Alteration Zone
Magnetic/Gravity/TM Lineaments
Magnetic Trend Line



5 cm

GN
TN
MN
GRID CONVERGENCE 1.0°
GRID/MAGNETIC 12.0°

012143

93-3439.

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : R.A.P.
DATE : April, 1993
DRAWN : G.M.B.
REFERENCE :
REVISIONS :

E.L. 2/90 - BOCO JV

OUTCROP GEOLOGY AND ROCK SAMPLE LOCATIONS

DRAWING No. SHEET 3B
SCALE 1:5000 0 100 200 METRES
FIG. No. 8

LEGEND

1. General Form

Colour, grain size, overall texture, Rock Type, constituents & textutres, alteration, mineralisation.

Descriptors and Rock Types to be separated by comma or slash. Derwent series 19 colours (in brackets) are intended for the Cambrian sequences.

2. Rock Types

Lavas L

a	(9)	acid
i	(46)	intermediate
b	(49)	basaltic
r	(9)	rhyolitic
d	(11)	dacitic
n	(46)	andesitic

Intrusives I

a	(12)	acid
i	(46)	intermediate
b	(49)	basic
fel		felsic
p		porphyritic
g	(12)	granitic
peg		pegmatitic

Volcaniclastics V

pm	(7)	pumiceous mass flow
q	(32)	quartz phyric mass flow
sst	(32)	sandstone
mf	(32)	graded crystal lithic

Sediments S

sh	(35)	shale
t	(36)	slate incl. black slate
slt	(35)	siltstone
sst	(39)	sandstone
tb		turbidite
w	(39)	wacke
cong	(39)	conglomerate
Δ		breccia
cht	(34)	chert
lst	(65)	limestone
dol	(65)	dolomite
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fgl	(4)	fluvioglacial deposits
alv	(4)	alluvial deposits
mst	(35)	mudstone

Metamorphic Rocks M
Colours should be hatched

sht	(38)	schist
sp	(35)	semi-pelite
ps	(39)	psammite
amph		amphibolite
gran		granulite
sk		skarn
mb	(65)	marble
m		mylonite

3. Descriptors

Colour:
ple pale, dk dark, clr clear, or orange, blk black, pk pink, rd red, brn brown, bl blue, wht white, yel yellow, ol olive, grn green, ppl purple, crm cream

Grainsize:
fg fine grained
mg medium grained
cg coarse grained
vcg very coarse grained

Overall Texture:
aug augen
p porphyritic
fol foliated
clvd cleaved
msv massive
blk blocky
bd bedded
lam laminated
xbd cross bedded
xlam cross laminated
br brecciated
fb flow banded
fΔ flow brecciated
ufs upwards fining sequence
hyl hyaloclastic
pill pillowed
pep peperitic

Constituents & Internal Textures:
f feldspar
q quartz
l lithic
pm pumice
styl stylolites
wsp wisps
ves vesicles
sph spherulites
lph lithophysae
mic micaceous
mag magnetite
cr chromite
px pyroxene
hb horneblende
op ophiolite

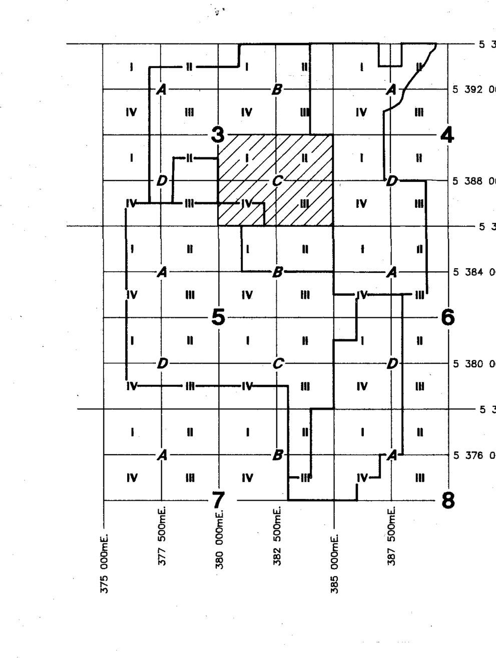
Alteration:
alb albitised
co carbonate alt
chl chloritised
ser sericited
kao kaolinised
ep epidotised
sil silicified

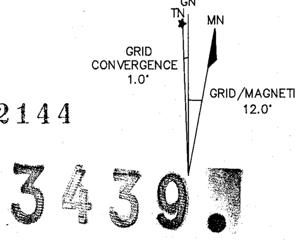
Mineralisation:
diss disseminated
str stringer
msv massive
gos gossan
bx boxwork
py pyrite
po pyrrhotite
asp arsenopyrite
gn galena
sp sphalerite
mag magnetite
hm haematite

3. Mapping Symbols

Unassigned [?] Use alone or as a qualifier to other rock types where uncertain.

- Strike and Dip of Strata (25)
- Strike and dip of inverted strata
- Strike and dip of cleavage or foliation (60)
- Plunge of lineation (50)
- Geological boundary position accurate
- Geological boundary position approximate
- Mine
- Abandoned prospect or mine
- Costean or trench
- Diamond drill hole, including projection
- I.P. Anomaly
- Unconformity
- Fault
- Thrust Fault
- Plunging antiform
- Plunging synform
- Shear/strong cleavage
- Sil + Ser + Py Alteration Zone
- Magnetic/Gravity/TM Lineaments
- Magnetic Trend Line



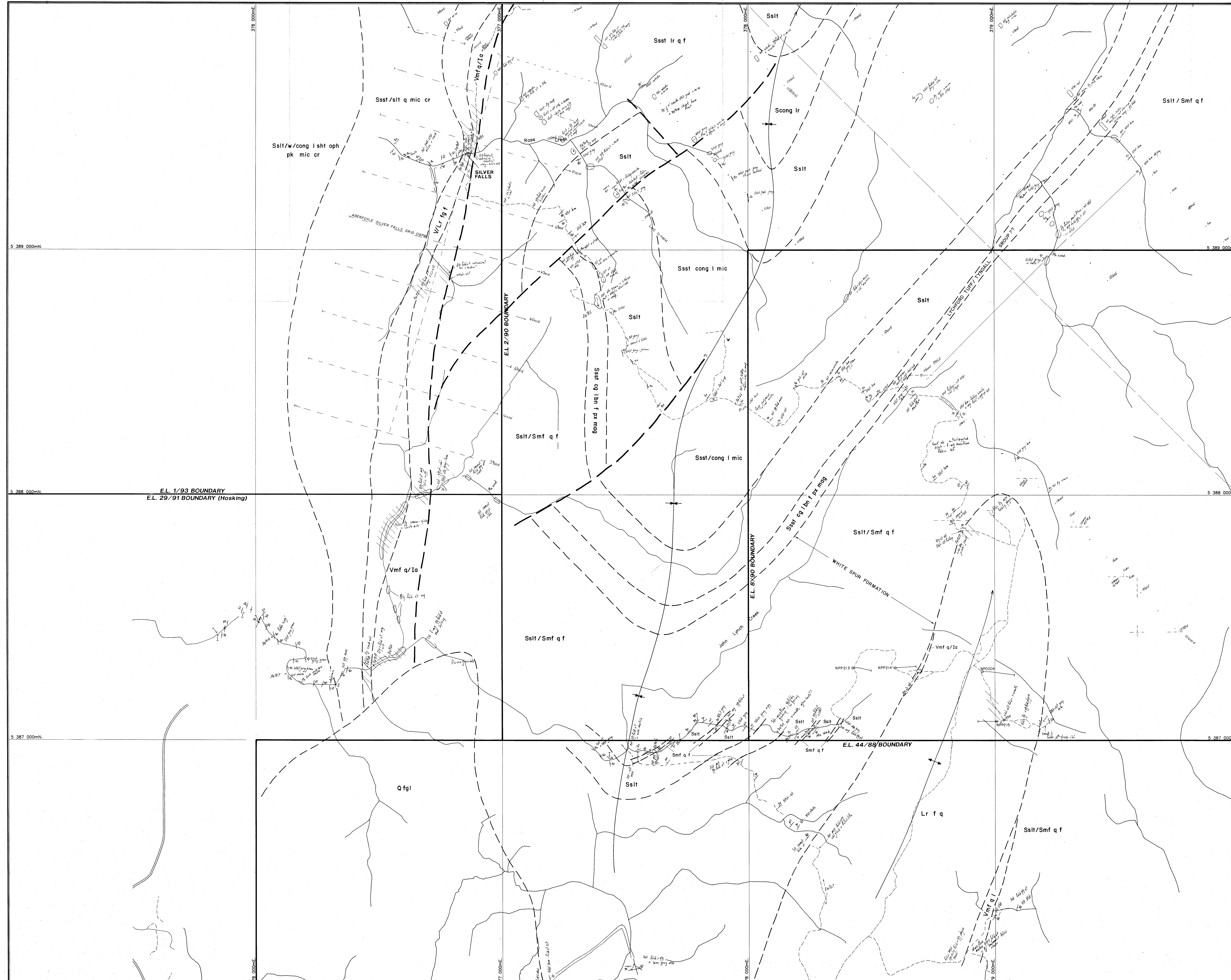


012144

93-3439

PASMINCO EXPLORATION
A Division of Pasminco Australia Limited

COMPILED : R.A.P.	E.L. 2/90 - BOCO JV
DATE : April, 1993	**OUTCROP GEOLOGY AND ROCK SAMPLE LOCATIONS**
DRAWN : G.M.B.	
REFERENCE :	
REVISIONS :	
DRAWING No. SHEET 3C	SCALE 1:5000 (0 100 200 METRES) — FIG. No. 9



LEGEND

1. General Form

Colour, grain size, overall texture, Rock Type, constituents & textutres, alteration, mineralisation.

Descriptors and Rock Types to be separated by comma or slash. Derwent series 19 colours (in brackets) are intended for the Cambrian sequences.

2. Rock Types

Lavas L

a	(9)	acid
i	(46)	intermediate
b	(49)	basaltic
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peg		pegmatitic

Volcaniclastics V

pm	(7)	pumiceous mass flow
q	(32)	quartz phyric mass flow
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mf	(32)	graded crystal lithic

Sediments S

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slt	(35)	siltstone
sst	(39)	sandstone
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w	(39)	wacke
cong	(39)	conglomerate
Δ		breccia
cht	(34)	chert
lst	(65)	limestone
dol	(65)	dolomite
q	(39)	quartzite
Fe		iron formation
gl	(4)	glacial deposits
fgl	(4)	fluvioglacial deposits
alv	(4)	alluvial deposits
mst	(35)	mudstone

Metamorphic Rocks M
Colours should be hatched

sht	(38)	schist
sp	(35)	semi-pelite
ps	(39)	psammite
amph		amphibolite
gran		granulite
sk		skarn
mb	(65)	marble
m		mylonite

3. Descriptors

Colour:

ple	pale	bl	blue
dk	dark	wht	white
clr	clear	yel	yellow
or	orange	ol	olive
blk	black	grn	green
pk	pink	ppl	purple
rd	red	crm	cream
brn	brown		

Grainsize:

fg fine grained
mg medium grained
cg coarse grained
vcg very coarse grained

Overall Texture:

aug augen
p porphyritic
fol foliated
clvd cleaved
msv massive
blk blocky
bd bedded
lam laminated
xbd cross bedded
xlam cross laminated
br brecciated
fb flow banded
fΔ flow brecciated
ufs upwards fining sequence
hyl hyaloclastic
pill pillowed
pep peperitic

Constituents & Internal Textures:

f feldspar
q quartz
l lithic
pm pumice
styl stylolites
wsp wisps
ves vesicles
sph spherulites
lph lithophysae
mic micaceous
mag magnetite
cr chromite
px pyroxene
hb horneblende
op ophiolite

Alteration:

alb albitised
co carbonate alt
chl chloritised
ser sericited
kao kaolinised
ep epidotised
sil silicified

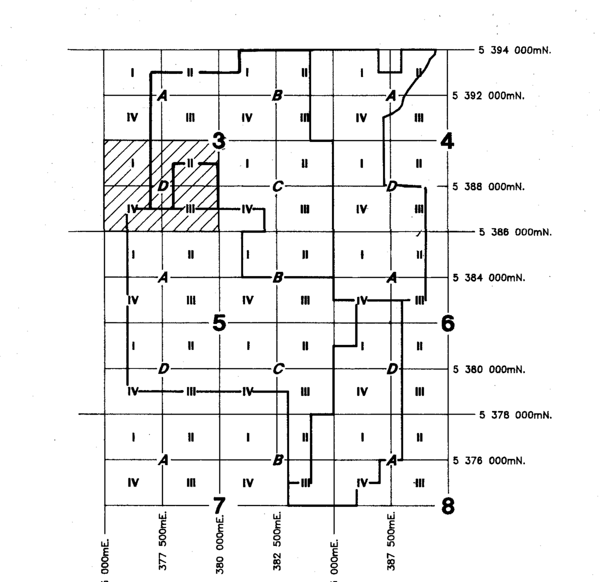
Mineralisation:

diss disseminated
str stringer
msv massive
gos gossan
bx boxwork
py pyrite
po pyrrhotite
asp arsenopyrite
gn galena
sp sphalerite
mag magnetite
hm haematite

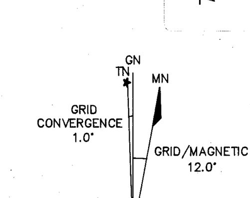
3. Mapping Symbols

Unassigned ? Use alone or as a qualifier to other rock types where uncertain.

25 Strike and Dip of Strata
Strike and dip of inverted strata
60 Strike and dip of cleavage or foliation
50 Plunge of lineation
Geological boundary position accurate
Geological boundary position approximate
Mine
Abandoned prospect or mine
Costean or trench
Diamond drill hole, including projection
I.P. Anomaly
Unconformity
Fault
Thrust Fault
Plunging antiform
Plunging synform
Shear/strong cleavage
Sil + Ser + Py Alteration Zone
Magnetic/Gravity/TM Lineaments
Magnetic Trend Line



5 cm



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REFERENCE :	
REVISIONS :	
DRAWING No. SHEET 3D	SCALE 1:5000 (0 100 200 METRES) — FIG. No. 10